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August 23, 1924

Electrical World

A Major Milestone

THE ELECTRICAL WORLD is fifty years old. It was established in 1874 as the *Operator* (devoted to telegraphy), and its name was changed with the development of the electrical industry to ELECTRICAL WORLD in 1883.

Thus the ELECTRICAL WORLD was ready at the birth of the industry to take up its responsibilities as recorder and interpreter of each detail of progress from design to commercial application of the thousands of developments that have come rapidly but logically to build up the structure that we know today as the Electrical Industry. It is gratifying to think of this span, short in years but greatly magnified by events, as fifty years of service.

As an inspiration to every one connected with the electrical industry and as one of the major milestones along its line of duty the ELECTRICAL WORLD will publish its fiftieth anniversary issue on September 20, 1924. It is planned to make this semi-centennial number stand as the greatest achievement in engineering and industrial journalism.

Today when the industry is clearly passing out of its era of preparation into its era of universal application this anniversary has peculiar significance. It is an appropriate time to review this brilliant period and to interpret it.

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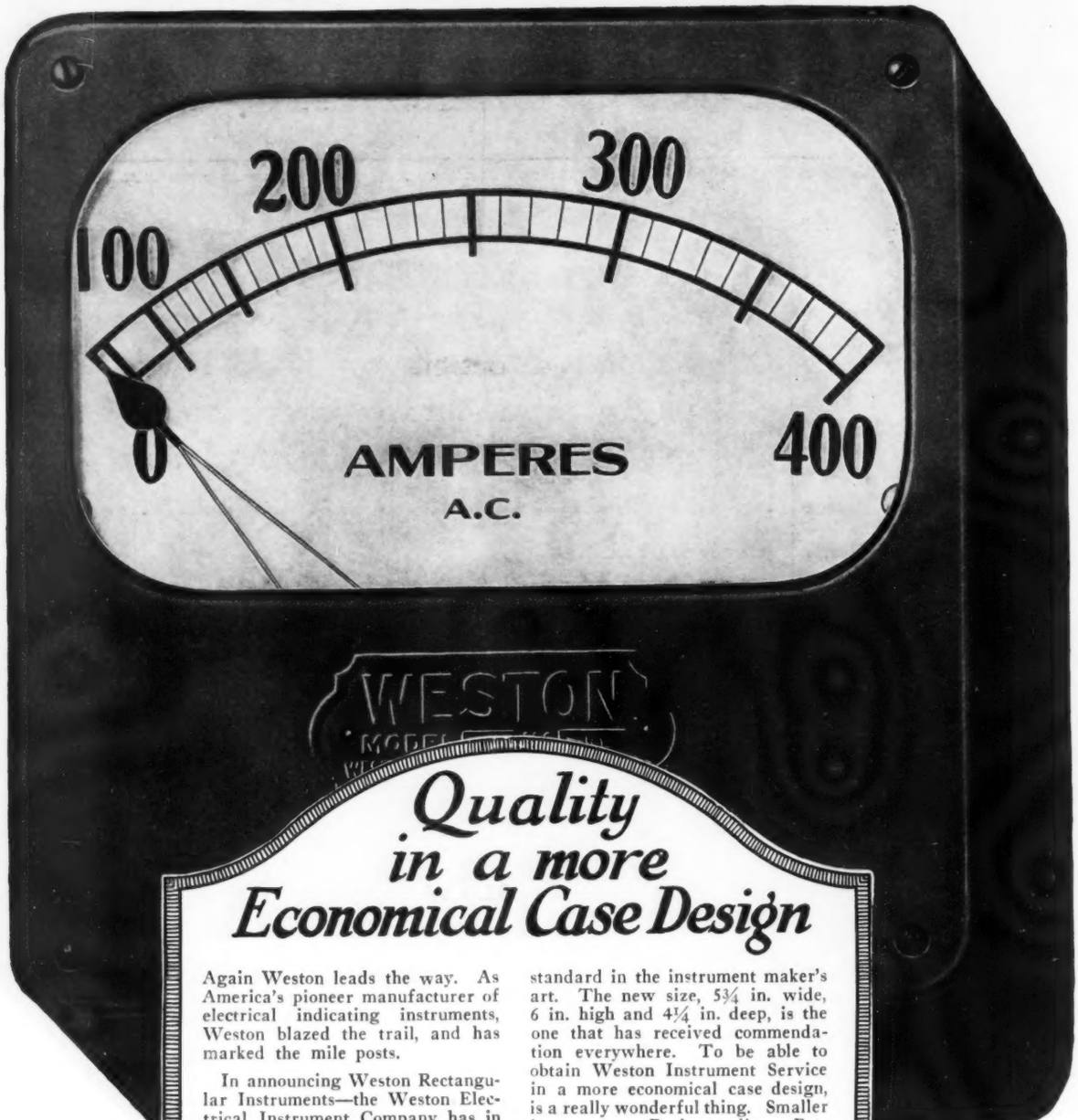

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

Published by McGraw-Hill Company, Inc.

W. H. ONKEN, JR. Editor — HAROLD V. BOZELL Editor

Volume 84 — New York, Saturday, August 23, 1924 — *Number* 8

Radio Makes Real Front-Porch Campaigns Possible

BACK in 1887 Park Benjamin wrote a book called "The Age of Electricity," and in it he made some "fanciful speculations" about a magnetic phonograph invented by Sumner Tainter. He pictured many uses for "magnetic plates" and in particular said they might prove a great boon to congressmen. An oration duly impressed on a magnetic record plate could be delivered simultaneously in Congress and at telephone exchanges throughout the country, at great convenience to would-be hearers and without any tax on the powers of endurance of either the orator or his audience. Today the radio makes possible and commonplace the accomplishment of greater marvels than Mr. Benjamin imagined. Plans are already under way to wage political campaigns in the air, and a nation-wide audience will be privileged to tune in for five minutes of Coolidge, Davis, La Follette or other political "big guns," wherever and whenever they may be speaking. Radio has made "front-porch" campaigning effective.

Yet the art has not been developed to its limits, and a few more decades may witness changes as great as those which have occurred since 1887. It may be there is a *né plus ultra* even in electricity, but there is no reason to think it has been attained. While the politicians and the audiences will gratefully accept and use the present radio facilities, the busy toilers in the field of electrical science will continue to delve and to develop. The fascination of the unknown is irresistible, and the utilitarian value of each new discovery or development increases as the years elapse.

The Mixed Blessing of High-Price Utility Stocks

WHEN, because of the combination of excellent management, efficient operation and high-grade financing, the stock of an electric public utility sells at a great premium, the logical move is to split the shares so as to bring them below par or, better still, to issue no-par-value common stock if the law permits. There is no advantage inherent in a public utility stock selling at 180 or above; in fact, there is a distinct disadvantage, because the public, not knowing the facts, draws unwarranted conclusions. Thus, for example, in Massachusetts electric public utilities are required to offer new stock to stockholders at a price to be fixed by the directors and sanctioned by the commission. Accordingly the Edison Electric Illuminating Company of Boston in 1922 offered new shares proportionately to its stockholders at $150 a share. The regular dividend is 12 per cent per annum, but the public is apt to look at the return, and not at the price per share paid, and to reason erroneously that the return is too high.

While no such restrictions are attached to the stock of the American Power & Light Company, a holding company with properties in Kansas, Nebraska, Oregon, Washington, Minnesota and the Southwest, the present market value of the common shares ($355) makes it advisable and desirable to substitute ten shares of no-par-value stock for one hundred-dollar share. This is done not because the stock cannot be sold at the high figure mentioned, but because electric public utility companies seek wide distribution of holdings among customers and employees. Moreover, the demagogue will contend that such a price per share indicates that the rates charged by a certain property are too high, whereas as a matter of fact that particular utility company may be "in red ink." It is to avoid such misunderstandings and misinterpretations that split-ups are made and that no-par stocks are issued.

A Delphic Utterance That Needs to Be Elucidated

JOHN W. DAVIS is an estimable gentleman who has served his country acceptably on numerous occasions and quite recently represented it at the Court of St. James. His utterances show him to be a man of intellectual attainments and firm convictions. Right now he happens to be the Democratic nominee for President of the United States, and there is no doubt that the party has in him a worthy and capable leader. His speech of acceptance, delivered at Clarksburg, W. Va., last week was remarkable in many respects. By some it will be regarded as of more importance than the platform adopted by the New York convention. In accepting the nomination Mr. Davis, among other things, promised to "conserve all the natural resources of the country and prevent the hand of monopoly from closing on them and on our water powers."

Of the theoretical available water power of the United States approximately 15 per cent is at present under development. The remainder is almost all under direct government control and supervision and for the most part is in the Far Western States, where the market cannot absorb the power developed. It was to establish a definite water-power policy and to safeguard the water powers of navigable streams and in the public domain that the Congress of 1920 enacted the present water-power act. This, all agree, is one of the most constructive pieces of legislation enacted by any Congress, and it was a Democratic administration headed by one of the foremost Democrats of the century that gave it to the country. That measure explicitly favors state and municipal governments without shutting the door to private initiative and enterprise. It provides for recapture and the regulation of rates and was most effective in checking Henry Ford's raid on Muscle Shoals. The measure did honor to the Democratic

party, and it is hard to believe that that organization now wishes to repudiate it or to undo the work of Woodrow Wilson. Was Mr. Davis' utterance an unthinking and meaningless one, in contrast with the definite outlines of the other policies he avowed, or did he take this oracular method of declaring his opposition to sinister attempts to invalidate or evade the law by such special legislation as that by which it is proposed to accomplish the Ford grab?

British Institutions Label but Do Not License Engineers

ELECTRICAL and civil engineers in England have developed a logical method for safeguarding engineering practice by restricting the use of the titles "electrical engineer" and "civil engineer." An endeavor was begun in 1920 to accomplish this by passing a law with a general object similar to that of American licensing laws. Difficulty was encountered and this method was dropped, but recently a new and better way of bringing the desired result has been put into operation.

Under this plan there have been reserved to the members of the Institution of Electrical Engineers and the Institution of Civil Engineers respectively the titles "chartered electrical engineer" and "chartered civil engineer." This was accomplished by getting the sanction of the Privy Council to changes in their charters. Under the new charters every member and associate member of the institutions may designate himself a chartered electrical or civil engineer and no others may use the titles. Prosecution will follow unauthorized use. The effect is not restrictive upon practice as are our licensing laws. No engineer is prevented from practicing his profession, but no one not a member of the professional organizations can use the restricted titles. The prestige and educational efforts of the institutions are relied on to convince the public that engineering work is safely intrusted only to chartered engineers, and in this way protection to the public will be assured.

This plan places directly upon the professions the responsibility to maintain their standards. It has many elements of superiority to our licensing laws and should be considered by American professional organizations.

Will Direct Current Ultimately Triumph in Transmission?

MANY years ago Lord Kelvin said that direct current would be used ultimately for transmission. A revival of interest in the subject is to be noted, and if really efficient converting machinery which will give reliable service under all conditions can be obtained, direct current is certain to come into general use for long high-voltage lines. This follows because direct current means less investment in lines and towers, better power factor and better operation. For example, the transmission of 100,000 kw. for 200 miles at unity power factor using 220,000 volts alternating current would require an investment of about $2,500,000 in towers and cables. For the same line and the same maximum voltage 300,000 volts direct current could be used and the investment in cables and towers reduced to about $1,500,000. If poor power factors are considered, these costs become still more divergent and, moreover, investments in synchronous condensers would be eliminated.

But there is no evidence of really successful power equipment to step up and convert alternating current to direct current at power stations or to step down and convert direct current to alternating current at the substations supplying the alternating-current distribution systems. It is possible to convert alternating current to high-voltage direct current by means of vacuum tubes and transformers and to reconvert from high-voltage direct current to alternating current by means of some type of rotating synchronous converter such as has been developed in England recently. But only a very limited amount of energy has been handled at the present time and many obvious financial and technical obstacles still remain before commercial installations can be made. Continuous experimentation and development will be required before the prophecy of Lord Kelvin comes true.

Diesel-Engine Field Is Rapidly Broadening

AMERICAN engineers have been rather slow in adopting Diesel engines for power production. This type of prime mover became available only after other methods and equipment were well established, and the tendency was to wait until operating experience was available. This was particularly true in the light and power industry, where service reliability is of paramount importance. Even today available experience has been had only in comparatively small plants, because the early engines were small and were best adapted to small loads and it was therefore desirable to find out the characteristics of small units first. There was also relatively greater difficulty in obtaining large units.

Data and experience accumulated over a period of years indicate that with modern Diesel engines of the usual size the question of maintenance and operating reliability has been answered and that for small stations where reasonably priced oil can be assured Diesel engines should always be considered in comparison with other equipment. Data on the characteristics and limitations of Diesel plants have been obtained, and the greatest problem in their use is to gage the fuel-oil conditions over a future period.

But recently there is an encouraging tendency to broaden their field of application and to increase their size. Engines of 5,000 kw. are proposed with the same degree of confidence by Diesel manufacturers as those of 500 kw. were proposed ten years ago, and many discussions have occurred as to the possibility of using Diesel plants of 40,000 kw. capacity and above. It is asserted that such plants operating with a thermal efficiency of about 30 per cent combined with the mammoth steam stations which also attain this efficiency form an ideal combination for efficient power production. Moreover, Diesel engines are proposed as sources of auxiliary power in very large steam stations, and they are suggested as auxiliary stations for hydro-electric systems.

Any move that will make for cheaper power and better service should be encouraged, and the suggestions just recorded should be carried to fruition for the benefit of the industry in at least one installation of each type.

Day-by-Day Barter of Electrical Energy

WHILE rate experts are pondering over an equitable contract and sliding rates under which two large interconnected operating corporations could exchange electrical energy, and over the required number of "whereases" and "provided thats" to forestall even the remotest cause of dispute, real life has developed as primitive a form of barter as can be found in the marketplace of a village in Central America. It is reported that after two large power companies in the East had completed a connecting line the following form of energy exchange "just grew" between them. Each morning, after the water conditions and the probable load to be expected have become known, the load dispatcher of one of the systems calls the other and says: "We could sell you 20,000 kw.-hr. today at so-and-so many mills per kilowatt-hour." The other checks up on his own power requirements and sources, and if he finds that under his load conditions and with the steam plants he cannot generate at or below such a figure, he says, "We will take the power." This constitutes the contract for the day. At each end of the connecting line is a watthour meter, with a ratchet to prevent a return movement, and the meters are read once an hour to preclude any "monkey business." Even should a dispute arise, it would only involve a couple of hundred dollars at the most and would not tend to spoil good relations.

Although this form of business relations in energy interchange is not recommended as final, much good service will be rendered, valuable experience gained and coal conserved before the experts are ready to recommend a more scientific or workable form of contract.

Graded Insulation for Light and Power Systems

A FAILURE of service is the most dreaded incident in the operation of a modern light and power system. This is true particularly of hydroelectric systems where long lines are connected to distant stations which have a minimum number of attendants. Experience has proved that it is economical to buy and install the best and most reliable equipment available and to assemble it with a view to minimizing the risk of service failure.

But system designers recently have attacked the problem from other angles. It is economical to install apparatus to isolate quickly a troubled portion of a system, and it is feasible to design a system so that breakdown points can be predetermined and located definitely. Adequate relaying is now recognized as a necessary and valuable factor in the service operation of systems, and while present relay systems do not yet fill all requirements, developments have been rapid and the art is rapidly becoming perfected.

The idea of predetermining and locating weak spots on systems is comparatively new to this country, but has worked out very satisfactorily in certain countries of Europe. It involves using what might be called graded insulation on the system. In this country systems have usually been insulated to withstand normal operating stresses safely and have been equipped with special apparatus to protect them against abnormal voltages. The alternatives are to insulate a system so thoroughly that excess voltages are harmless or to grade the system insulation so as to locate breakdown points. In Sweden, for example, it is usual to care for excess voltage by providing only shunt resistances on current transformers and ground resistance in the neutral.

The cost and difficulty of insulating a moderate system to be safe against all excess voltages usually force engineers to use graded insulation so that unavoidable breakdowns will occur at definite points and result in the least possible disturbance to service. Generators, transformers and lines, for example, are highly insulated and busbar insulators for switching equipment and substation insulators are made comparatively weak. The adequacy and type of relaying employed, the system layout and the magnitude of the energy available determine very largely the points where the poorer insulation may be utilized. Only further experience on a wider scale can determine the relative merits of this scheme and of others, but, while many objections to it are evident, it has great possibilities for reducing costs, increasing service reliability and insuring greater simplicity in system layouts.

Field for Electric Heaters in Industry Neglected

MORE installations of electric heaters should be made for heating factory buildings and substations. As electric power becomes universally used and as buildings multiply in number and character the field of electric heating increases. There is also a more complete realization today that efficiency in production and in operation is greatly increased when both men and machinery work under proper temperature conditions.

The advantages of electric heating for many applications are almost self-evident. The heaters transform 100 per cent of the energy into heat, they can be placed where desired, and their temperature can be controlled cheaply and easily. They require little attention and minimum space for installation. They are flexible to changing production or heating requirements. They have a low first cost and involve small expense for maintenance. In many respects they are better suited to heating requirements than any other form of heating. They should prove very economical for those industries that require heating only a few days in the year, or at night or in the early morning hours.

Too frequently electric heaters are not used because of false or imperfect analyses of operating costs based on a comparison of steam heat and electric heat. This comparison should never be made on the basis of purchasing equal quantities of heat units as fuel or as electric power. Every factor involved in heat utilization and equipment investment should be considered, and if radiation, floor space, stack losses, condensation, piping, operating and maintenance costs are carefully considered for a steam installation, the use of electric heaters will often be found more economical.

But in many cases where direct operating costs show little advantage for electric heaters a study of control, production, sightliness and convenience will prove the advantage of electric heating, particularly when it is remembered that the actual cost of heating a building is a small fraction per unit of manufactured product. If the cost of energy is the deciding element, why are six-cylinder automobiles used or why is illumination of high intensity considered a manufacturing asset?

There is a big undeveloped field in this business for central-station companies, even in their own generating stations, shops and substations.

John J. O'Brien

Because of his broad experience, analytical ability, fairness, independence and power of concentration he represents the type of utility executive to lead the industry to even greater achievements.

ORGANIZATIONS combining the three functions of engineering, management and financing have contributed greatly to the development of the electrical industry. One of these organizations of national prominence recently lost its founder and leader, Colonel H. M. Byllesby, and a new man became president of H. M. Byllesby & Company and the Byllesby Engineering & Management Corporation. This new president is John J. O'Brien, a plain and unassuming business man, intensely and tirelessly concentrated upon the affairs of his organization. His selection was popular both within the organization and throughout public utility and banking circles.

Mr. O'Brien, who has no business interests whatsoever outside of the Byllesby organization, possesses the combination of penetrating analytical ability and an energetic, cheerful, friendly personality. He sees no virtue in worries and anxieties and believes that honest, intelligent effort will overcome everything but actually insurmountable obstacles. Accessible at all times to his associates, he trusts them implicitly and holds each man responsible for his own work. He has not only their respect but their personal affection as well. His outstanding characteristics are those of fairness and justice, independence of thought and action and a capacity to make enduring friendships.

Born in Chicago fifty-five years ago, Mr. O'Brien was educated in the public and parochial schools, took a business college course and got a job with the Pullman Company. When Colonel Byllesby was starting to weld together what has become a great group of utility properties—just prior to 1902—Mr. O'Brien was the chief clerk and auditor for the Chicago territory of the General Electric Company. For about fifteen years he had had the opportunity to observe and analyze central-station companies from the critical and all-revealing standpoint of financial performance. With this background his early services to the Byllesby company were those of the expert accountant. When the company was incorporated in 1902 Mr. O'Brien was one of the original partners, and for years he filled the position of vice-president and treasurer.

His association with Colonel Byllesby and the other partners was of the closest kind. His acquaintance with all phases of the business became intimate, but his specialty has consisted in planning financial structures and securing the co-operation of investment banking houses. The soundness of his judgment has been demonstrated many times in the upbuilding of companies with an immense investment.

Installing Cable Across Hudson River

Rocky Bottom and Swift Tidal Current Necessitate Spiral Armor of Steel Tape Reinforced with Steel Wires—Cable Laid by Tugboat Especially Adapted to Cope with Difficulties Met in This Type of Work

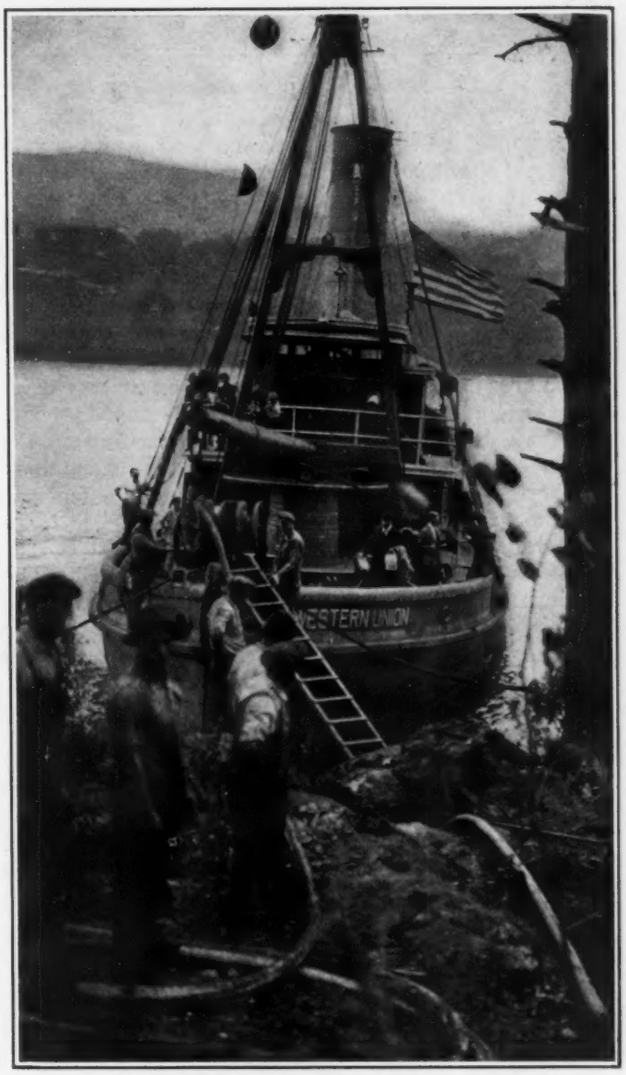
By F. A. WESTBROOK
Consulting Engineer, New Canaan, Conn.

A SUBMARINE cable in one continuous length of 2,700 ft. has been recently laid across the Hudson River at Garrison, just below West Point, by the Philipstown Electric Company. The make-up of the cable and the method of laying it presented some features not encountered in every-day practice. The cable is to carry current from the east side of the river to the west side for local distribution in the immediate vicinity of Garrison. Power is to be transmitted at first at 2,300 volts with ungrounded star-connected transformers, and this will later be changed to 4,000 volts with the neutral grounded.

As the transmission requirements involved only local distribution, it was considered preferable for reasons of economy to install a submarine cable rather than construct an aërial crossing. The latter method, a more expensive one, would be justified only where an important tie line is under consideration. It was decided to use steel tape armor with a second armor of steel wires on the cable because of the rocky bottom and swift tidal currents in this narrow part of the river. Were two armors of helically wound steel wire used there would result a very heavy cable of large diameter which would be difficult, if not impossible, to transport and install in one continuous length. The use of steel tape with a small space between turns, with a bedding of jute between it and the rubber insulation on the inside and the steel wire armor on the outside, preserves most of the flexibility of a single armored cable and obviously at the same time greatly increases its mechanical strength. The make-up of the cable, manufactured by the Habirshaw Electric Company, Yonkers, N. Y., is summarized in the accompanying table.

To transport the cable from the factory and to lay it across the river a cable boat of the Western Union Telegraph Company was employed. The complete equipment and highly experienced crew of this boat made it the logical and most efficient means for handling the work. At the factory the cable was run from the armoring machine directly into a large testing tank. When ready for loading on the boat it was passed up through the roof of the tank and over a series of pulleys to the edge of the dock, whence it was taken aboard and coiled up on the drum.

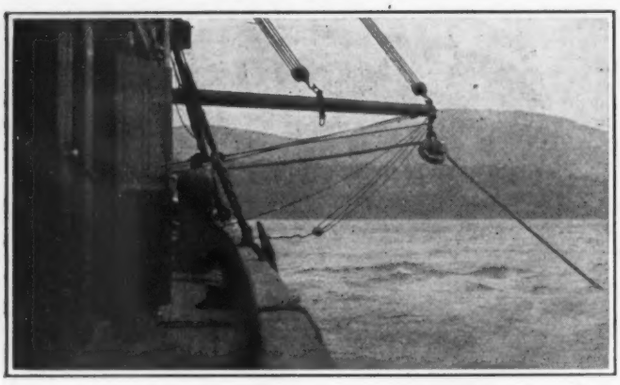
The difficulty of laying the cable was greatly increased by a swift tide flowing up the river, the effect of which was much aggravated by a strong south wind blowing directly up the river. On account of these as well as other local conditions, it was decided to make the first landing on the west shore. Even on this side railroad tracks close to the water's edge complicated the operation of landing the cable. An iron pipe conduit was placed under the tracks, one end of this extending well out into the water and the other end brought out on the land side of a freight house along the tracks.



LOADING CABLE INTO TUGBOAT
The cable was taken through the roof of the testing tank and passed over rollers to the drum on the boat.

The conduit was then threaded with a wire attached to a block of wood at the water end, which was easily picked up by the men in a rowboat.

The first operation in pulling the cable through the conduit necessitated the taking of a heavy pulling rope to shore, passing it through a pulley attached to the base of the first pole in the open-wire line about 50 ft. from the freight house, and then pulling this through the conduit by means of the wire referred to above. This rope was then picked up and fastened by means of a very long underground pulling "basket" to the cable on the tug. The free end was passed around a steam winch on the tug and the cable pulled through



PROCESS OF LAYING CABLE ACROSS RIVER

the conduit. To avoid running the rope over the railroad tracks that portion attached to the winch was first passed through a drain under the tracks and freight house. No trouble was experienced in getting the end of the cable into the submerged end of the conduit. The precaution was taken, however, of lashing the conduit to heavy timbers at the edge of the water so that the friction of the cable moving through would not tend to carry the conduit along with it.

Another feature which had to be taken into consideration was to guard against the tug pulling itself aground. As it was necessary to have a very long line on the anchor on account of the strong wind and tide, there was a tendency for the boat to be swung around into the shore by the pulling operation, and this had to be counteracted at times by the ship's engines.

The unwinding of the cable was accomplished by means of power with the brakes on the drum. This was to prevent overrunning, as might easily happen if the drum were free and also to relieve cable and gear from avoidable stress on account of braking.

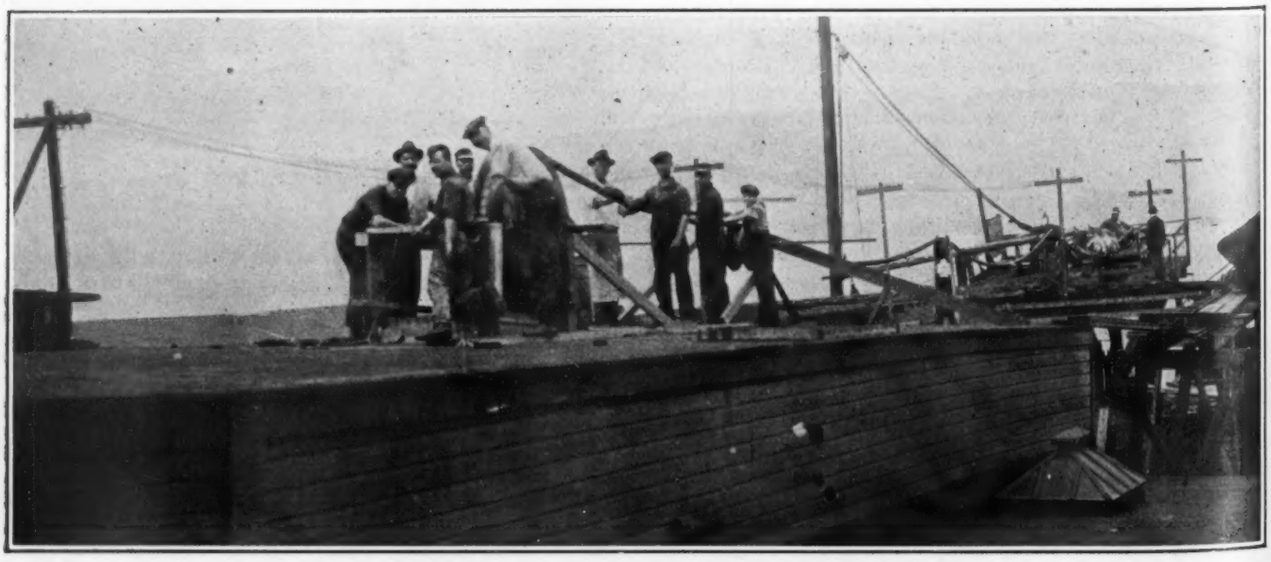
The cable was pulled up to the terminal pole of the aërial line, and then, in order to provide slack for the vertical run of the cable up the pole, it was necessary to pull it still further. This was accomplished by slipping off the "basket" and making a hitch with the rope 30 ft. or 40 ft. back. The cable was protected against damage by pinching by placing pieces of lead sheathing under the hitch. The rope was also lashed to the cable at three or four points. It was then possible to draw it along, each lashing being cut as it came up to the snatch block.

One end of the cable being landed, the next operation was to lift it into the snatch block at the end of the boom on the boat for laying it across the river. This process is shown in some of the accompanying illustrations. A rope tied at one end to the cable was passed over the boom and around a winch by means of which it was raised into place. Raising the anchor was a very delicate operation and especially difficult with the strong wind and tide prevailing at the time and the close proximity of the boat to shore. In raising the anchor it was imperative to prevent the anchor from catching on to the cable, or the hawser or anchor from pinching it against the side of the boat. Extreme care was required in this operation.

The necessity of providing a generous amount of cable in addition to that required for a straight line crossing became evident during the maneuvers which had to be gone through to raise the anchor without damage to the cable. In the first place, as stated, the character of the river bottom, tide and wind made it necessary to have out a very long hawser. Consequently, before the anchor could be raised the bow of the boat was pulled to a point directly over it, a distance of a hundred feet or more, which meant putting overboard a corresponding amount of cable without any progress toward the opposite shore; and, as the anchor was caught in the rocks, considerably more turning and moving about was done before it

FEATURES OF 2,700-FT. SUBMARINE CABLE LAID ACROSS HUDSON RIVER

Number of conductors	Three
Size of conductors	No. 2 A.W.G. stranded and tinned
Thickness of insulation	12/64-in. 30 per cent Hevea rubber
Covering over insulation	One rubber-filled tape 2½-in. wide with ½-in. lap
Grouping of conductors	Twisted
Fillers	Paraffined jute
Covering over fillers	Rubber-filled tape 1½-in. wide with ½-in. lap
Bedding for armor	100-lb. jute impregnated with "Texaco" non-hardening compound
Armor	One galvanized steel tape 0.030-in. thick, 1 in. wide, with ½-in. between turns
Covering over tape	Two layers 100 lb. jute impregnated with "Texaco"
Armor wires	Thirty-two No. 6 B.W.G. galvanized steel
Outside covering	Two layers No. 16 three-ply jute impregnated with pitch and soapstone finish
Outside diameter	2.8 in.
Weight	21,944 lb.
Length	2,700 ft. continuous



METHOD OF LOADING CABLE FROM TESTING TANK ONTO TUGBOAT

could be loosened, all of which meant paying out more cable.

In laying the cable across the river the ship could go ahead at as fast a speed as was safe on account of the narrowness of the river at this point. The cable was not a controlling factor in this case. The drum was allowed to run free, but was prevented from overrunning by a hand-applied brake on the rim, controlled by a man who carefully watched it.

To land the cable on the east side was much easier and simpler than it had been to land it on the west side, first, because there were no railroad tracks at the edge of the river and, second, because the shore adjacent to the landing consisted of a wall of rock which dropped almost vertically into a considerable depth of water. Soundings showed that it would be safe to push the bow of the boat against this wall and moor to trees on the shore. As this spot was sheltered from the wind and as the tide was about at the turning point, it was not difficult to hold the boat in position. There was a convenient opening in the wall of rock leading from the land down into the water in which the cable was laid. As it was possible to get the boat right up to shore, the cable was handled by the cable gang entirely without the aid of tackle. The job was carefully planned and handled by a skilled crew.

Standardizing Small Substations

Three Types of Station Are Used for 2,200-Volt and 4,000-Volt Distribution with Capacity Up to 6,000 Kva. — Smaller Stations Are Automatic — Complete Station May Be Requisitioned Out of Storeroom

By J. C. GAYLORD

Engineering Department Southern California Edison Company, Los Angeles, Cal.

IN SERVING electrical energy to a large territory consisting of rapidly growing communities of various sizes it is necessary that a great number of substations, some large and some small, be provided. It is also necessary that provision be made in these substations for adding to their capacity and for increasing the number of distribution circuits radiating from them without interrupting service and without too great expense. It is with these facts in mind that the Southern California Edison Company has developed a series of small standard substations. These stations vary in capacity from 200 kva. to 6,000 kva. and have from two to ten 2,200-volt or 4,000-volt distributing circuits each. Other standard stations have been designed for 11,000 volts, 15,000 volts and 60,000 volts and of various capacities. This article will describe only the small stations for 2,200-volt or 4,000-volt distribution.

The advantages of standardizing on the design of small substations may readily be appreciated. No preliminary design or drawings are necessary, and when it is decided to erect a substation of a certain size at any location it is only necessary to requisition out the material for one complete station. This not only saves time and expense but facilitates the erection and placing in service of the station. These considerations are very important on a system the size of that of the Southern California Edison Company, where it was estimated at the beginning of 1924 that it would be necessary to cut in an average of one new substation every five days during the year to meet the needs of the growing communities served.

This series of stations is divided into three groups—first, stations for very small towns which are growing comparatively slowly and have a total demand of from 200 kva. to 750 kva.; second, stations for larger towns or districts, which have a greater demand and require more circuits, and, third, stations for the larger small towns more densely settled, which require up to 6,000 kva. capacity and from four to ten distribution circuits. The stations of the first groups are seldom provided with an attendant, while stations of the third group nearly always have operators.

The stations of the first group are similar to the one shown in Fig. 1 and are fed from an 11,000-volt or a 15,000-volt line through a pole-top switch and a small automatic oil switch. The other equipment in these stations consists of a bank of small self-cooled outdoor-type transformers, set on a concrete slab outside the building; a single three-phase induction regulator placed inside a corrugated-iron building about 7 ft. 6 in. square and one or two small oil circuit breakers for the distribution circuits, together with station light and power transformers and such meters and instruments as may be necessary. There is also room in this type of station for the equipment for one street-lighting circuit. As shown in the single-line wiring diagram Fig. 2, these stations are provided with an ammeter which may be connected into either leg of the circuit, a voltmeter and a ground detector. The station light and power transformers provide for lighting the station and power for the motor on the induction regulator. Provision has been made so that a watt-hour meter may be installed to register the total station output and also for a recording voltmeter and a recording ammeter with transfer switches for connecting the instruments, to any of the three legs of the bus.

The building is constructed on an angle-iron frame so that it may be dismantled and moved to a new location whenever desired. The only loss in setting up one of these stations and later moving it to a new location is the concrete slab, some conduit and the labor of installation. The stations are usually so arranged on the site that the next-size station can be installed without seriously interrupting service.

SUBSTATIONS FOR LARGER TOWNS

The second group of stations is somewhat more elaborate in construction. This group is used where from three to six feeder circuits and one street-lighting circuit are required. One of these stations is shown in Fig. 3A, which is from a photograph of the Bellflower

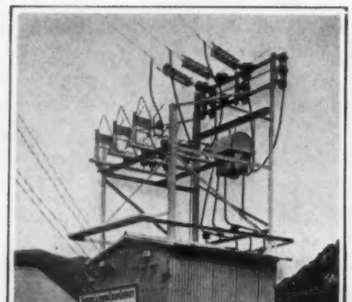


FIG. 1—SMALL-CAPACITY STANDARD DISTRIBUTION SUBSTATION

FIG. 3A—STANDARD STATION FOR ULTIMATE CAPACITY OF 1,000 KVA.

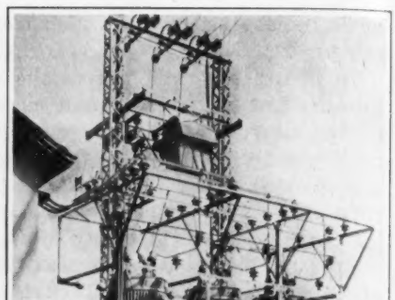


FIG. 3B—OUTDOOR EQUIPMENT FOR STATION OF THIS TYPE

substation. Fig. 3B shows the outdoor equipment for a substation of this group.

The single-line wiring diagram for this type is shown in Fig. 5. As usually installed, these stations start out with a bank of three 250-kva. transformers, one three-phase induction regulator, three or four 2,200-volt or 4,000-volt feeder circuits and one controlled primary street-lighting circuit. As the load on the station grows more circuits, larger transformers and another regulator are added until the ultimate station consists of a bank of three 1,000-kva. transformers, two induction regulators, six feeder circuits and one street-lighting circuit.

Following the single-line wiring diagram Fig. 5 through from the high-voltage to the low-voltage side, first will be found a pole-top air-break switch which may be used to disconnect the station from the 11,000-volt or 15,000-volt source. When this is done the feeder circuits are picked up by other near-by stations through switches in the distribution system. The lightning arresters are connected to the line through disconnecting switches and are supported on an independent steel pole. Choke coils, an automatic oil circuit breaker and the high and low-tension transformer bus, as well as the pole-top switch, are supported on angle-iron frame between two steel poles, as shown in Fig. 3B. The main transformers stand on a concrete slab separate from the building. From the transformer low-tension bus the wiring enters the building either at the side or at the end, as may be convenient.

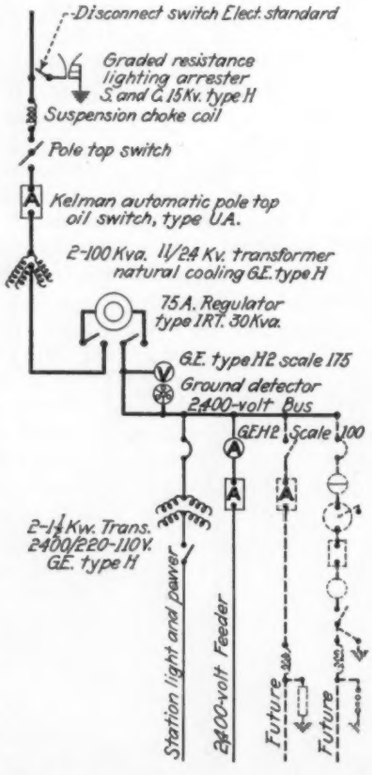

Disconnect switch Elect. standard
Graded resistance lighting arrester S. and C. 15 Kv. type H
Suspension choke coil
Pole top switch
Kelman automatic pole top oil switch, type UA.
2-100 Kva. 11/24 Kv. transformer natural cooling G.E. type H
75 A. Regulator type 1RT. 30 Kva.
G.E. type H2 scale 175
Ground detector
2400-volt Bus
GEH2 Scale 100
2-1½ Kw. Trans. 2400/220-110 V. G.E. type H
Station light and power
2400-volt Feeder
Future
Future

FIG. 2—WIRING DIAGRAM FOR STATION SHOWN IN FIG. 1

Inside the building the regulators, with their automatic and metering equipment, oil switches and cut-out switches, are placed along one side of the room, and the station bus, feeder switches and other feeder equipment are on the other side, the bus running lengthwise of the building.

In order to test the watt-hour and curve-drawing meters with their instrument transformers test switches are provided as shown in the diagram. To make the tests the test man opens the two outside switches and connects the primaries of his current transformers between the lead terminals of these two switches, then closes them and opens the middle switch, thus connecting his calibrated current transformer in series with the circuit without having worked on any energized conductors. These switches have proved very convenient.

Regulator cut-out switches are provided for each regulator to insure the least interruption of service in case it becomes necessary to take one of the regulators out of service. It will be noted that there is a sectionalizing switch in the bus so that one or both parts of the bus may be fed through either regulator. Ordinarily each regulator feeds only its own end of the bus. The feeder-circuit equipment has no features out of the ordinary. Each circuit is equipped with an automatic oil circuit breaker and an ammeter. The three-phase street-lighting circuits are equipped with a double-pole and single-pole oil switch, being tripped out by a time clock at predetermined hours for double-schedule lighting service. All circuits are generally carried out of the station underground with lead-covered cable in iron conduit to the first pole away from the station property, though occasionally they are brought out overhead. Lightning arresters are used on all outgoing feeders. These are placed on a pole near the station.

The buildings for these stations are made of structural steel frame covered with flat sheet iron, with the supporting frame so arranged that the pipe frame inside for mounting the switches and bus work can easily be attached to it. The building as well as all the indoor and outdoor equipment for the stations are standardized, and the aim is to keep the parts for one or

more complete substations of this type in stock so that one can be built at any location on short notice.

The third group of stations is used for the larger of the small towns, and, as stated, these nearly always have an attendant. A station of this group is usually fed from a 15,000-volt or 11,000-volt loop line or from at least two independent lines. The high-voltage equipment is installed out of doors on a frame made up of lattice-steel poles and other structural members, or on a standard pipe rack when more than two circuits are involved. The high-tension switches are equipped with bushing-type current transformers and induction-type relays of either the definite time-limit overload or directional variety as the case may require. The transformers are usually self-cooled.

The indoor equipment, as shown in the single-line wiring diagram Fig. 6, consists of an induction regulator for each feeder circuit, a main bus for normal operation and a transfer bus so arranged that any circuit may be fed from it and the switch and induction regulators for that circuit cut out for inspection or repairs. The metering and protective equipment for this group of stations is similar to that described for group two. In case a regulator is not warranted on each circuit, and as an initial installation the main bus is sectionalized and a regulator connected to each section as shown in Fig. 3B. The regulators are supplied from a "jack bus" between them and the transformers. When this is done, however, the regulators are so placed in the station that at any time it is found necessary the "jack bus" may be taken out and a regulator put on each circuit, which gives the arrangement indicated in the wiring diagram shown in Fig. 5.

FIG. 4—TYPICAL BRICK SUBSTATION FOR CAPACITIES UP TO 6,000 KVA.

The building for this group of stations is 16 ft. wide and as long as the number of circuits installed requires. It may be the same ype of building used for the second group or may be brick or concrete as the location demands. Fig. 4 shows a typical station of this type built of brick.

The above three groups of stations cover nearly all the requirements for 2,200-volt or 4,000-volt distribution as found on the Southern California Edison Company's system. Cases not covered by these standard stations are worked out individually as they arise.

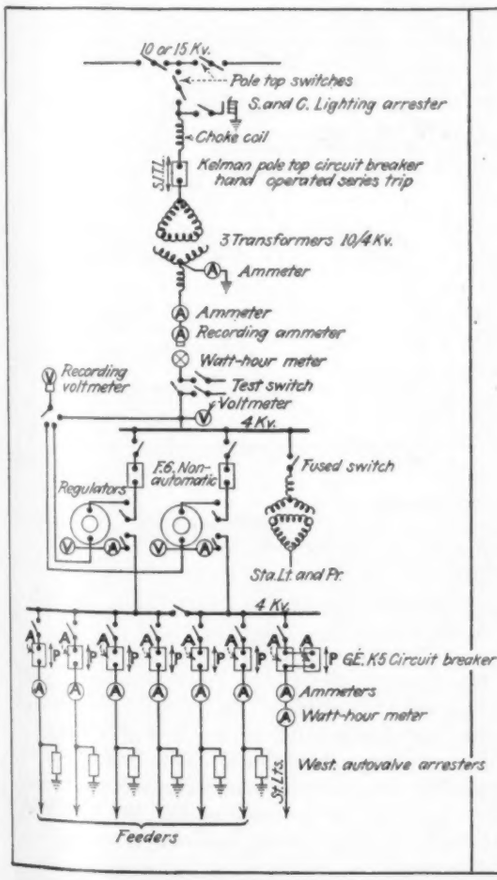


FIG. 5—WIRING DIAGRAM FOR STATION SHOWN IN FIG. 3

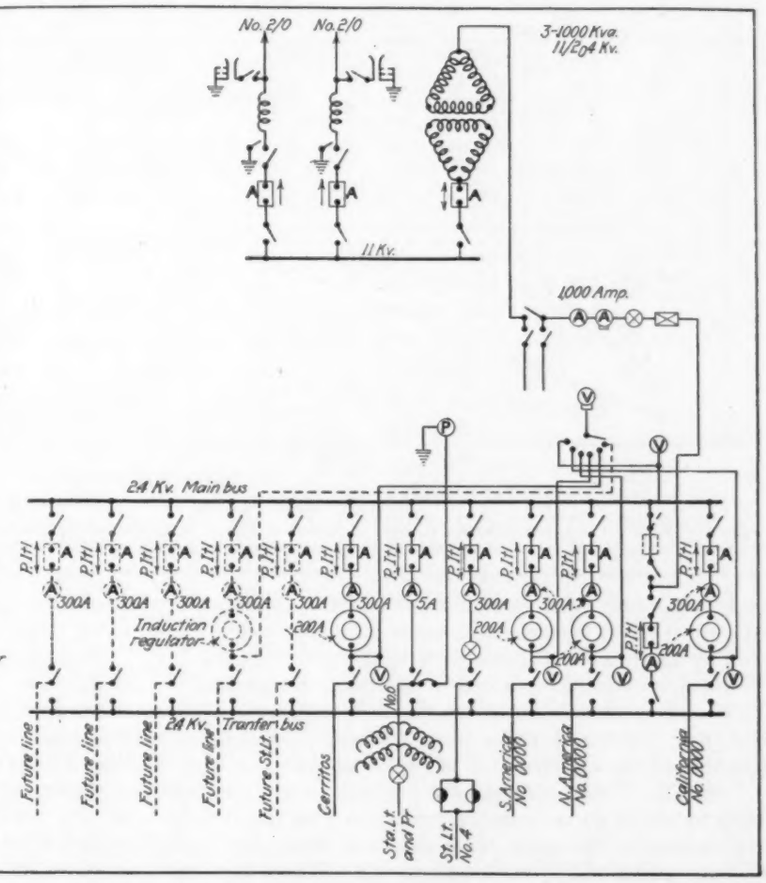


FIG. 6—EQUIPMENT WIRING DIAGRAM FOR STATIONS WHERE AN OPERATOR IS EMPLOYED

Hot Spots and Overload Indicators—II

Tests Conducted to Determine Accuracy, Time-Lag, Correct Setting, Etc.—Limitation of Overload Indicators in Practical Operation—Conclusions Based on Analysis

By HAROLD COLE
Distribution Engineer Detroit Edison Company

WITH a view toward securing information that would enable the operation of transformers at their ultimate capacity without endangering serious overheating, the Detroit Edison Company conducted a series of tests to determine the location of the hottest spots in transformers, the best practical location for overload indicators, the thermal gradient between the hottest spot and oil, and the maximum safe loads for different seasons of the year. These tests were described in ELECTRICAL WORLD for August 16, page 314. In this article comparisons are made of various overload indicators to ascertain their relative accuracy, visibility, durability, ruggedness and permanence, adaptability or ease of installing and responsiveness to temperature changes.

Three makes of overload indicators, designated as X, Y and Z, were included in the test and some of the features of a fourth make were studied. The principal features of the construction of each follow:

Type X.—These indicators have two brass L-shaped arms mounted on the same vertical shaft as the indicating element. Normally they are held apart by a low melting point alloy immersed in oil. When the temperature rises sufficiently to melt the alloy, springs pull the arms together, thus indicating an overload on the transformers.

Type Y.—These indicators show a white signal before a window when the critical temperature is reached. The actuating element, which is of the bimetallic type, is designed for immersion in the oil above the winding of the transformer.

Type Z.—These indicators are made in the form of a small box, from the bottom of which a colored indicator projects when the temperature reaches the point at which it is set to operate. The actuating element, which is also of the bimetallic type, is surrounded by the oil in the bottom of the transformer when the indicator is installed.

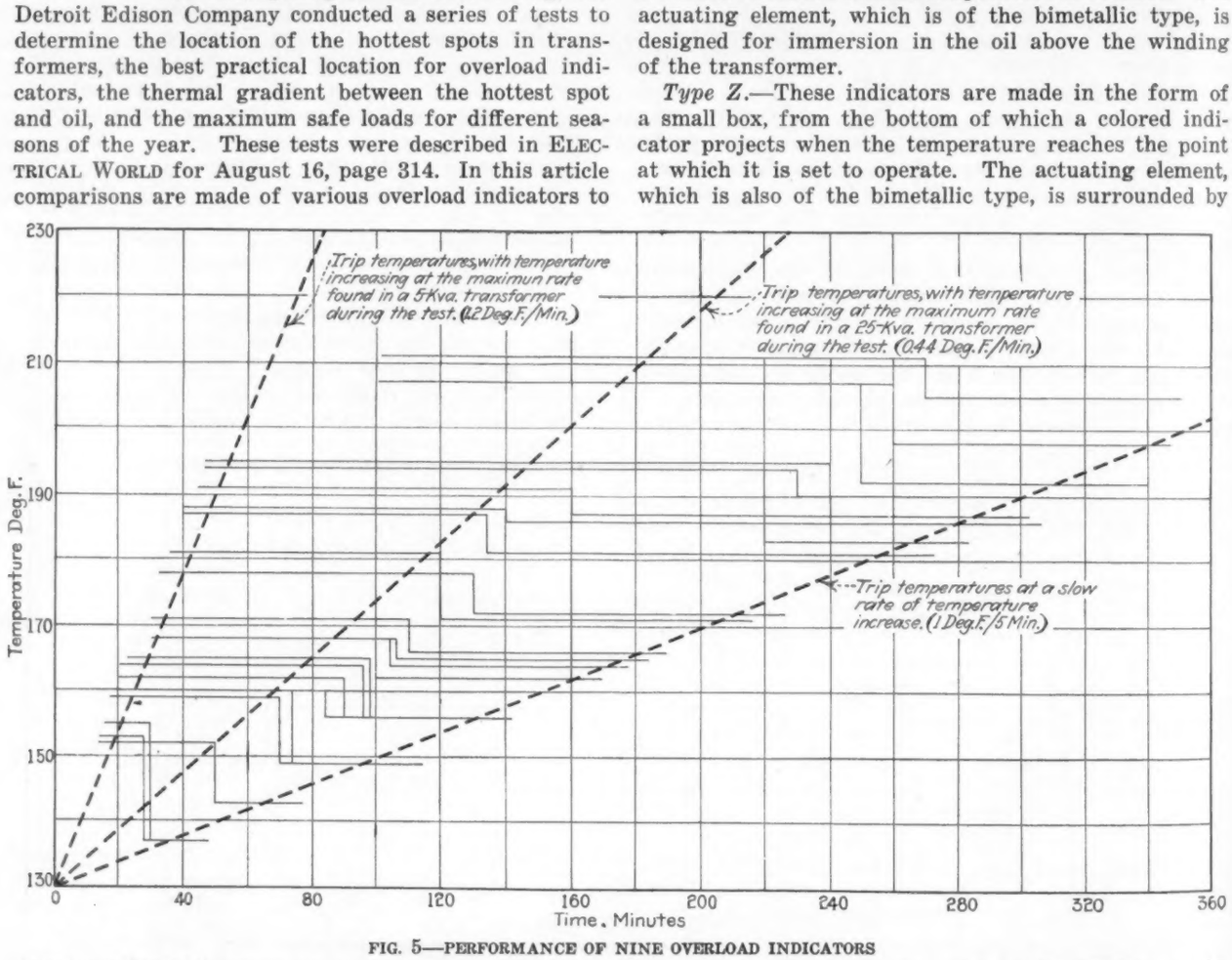


FIG. 5—PERFORMANCE OF NINE OVERLOAD INDICATORS

Each horizontal line corresponds to one or more overload indicators. The points at which a horizontal line intersects the three diagonal lines indicate the trip points of the indicator for the conditions represented by the respective diagonal lines.

The fourth make of overload indicator studied is very similar to the type Z indicators in appearance and method of indicating overload. The actuating element, which is of the bimetallic type, is designed for immersion in the oil above the windings. This indicator is so designed that a correction is made for the variation of the hottest spot to oil gradient with the ambient temperature. It is the only one of the indicators studied having this feature.

According to the tests made, the three types of indi-

cators rank as follows: Accuracy, X, Y, Z; visibility, X, Y, Z; durability, X, Z, Y; adaptability, Y, X, Z; responsiveness, Y, Z, X. The advantages and disadvantages of these various indicators are given in the panel.

Accuracy Calculation and Time-Lag Test

To calibrate the overload indicator the actuating element of each was immersed in the oil, the temperature of which was raised at the rate of 1 deg. F. every five minutes until the indicator tripped. According to these tests, type X overload indicator tripped at 0.1 to 0.5 per cent below the designed trip temperature, type Y at 3.25 to 10.5 per cent below the designed temperature, and type Z at from 2.9 to 12.2 per cent above the designed trip at one setting to 6.4 per cent below the designed trip rating at another setting.

Comparative time lag was determined by two methods. One involved immersing the actuating element in an oil bath, the temperature of which was 3 deg. F. higher than the respective trip temperatures and required the noting of time needed for the indicators to trip. The other test of time lag was made by immersing the indicators in an oil bath and raising the temperature rather rapidly (about 1 deg. F.). The difference between the temperature at which the indicators tripped during this test and that at which they tripped during the accuracy test (when the temperature of the bath increased so slowly that there was no appreciable time lag), gave an indication of the relative amount of lag in the indicator. In these tests the type Y indicators had the least amount of lag.

Since it appeared that the melting point of the alloy in the type X indicator might change with length of service, a test was conducted with two of these indicators. This test consists of approximately 1,000 cycles of heating and cooling between 38 deg. C. and 66 deg. C., corresponding to about three years of service. The tripping point was determined before and after the test. Despite expectations, these tests showed that the trip temperature changes very little during a long period of service, increasing from 73.9 deg. C. to 74.2 deg. C. in this series of heating and cooling cycles, equivalent to about three years of service.

Visibility of the different makes of overload indicators as well as their durability and adaptability were decided from their appearance mounted on a transformer and from an inspection of their construction and workmanship.

Calculation of Correct Settings

To determine the correct trip temperature setting for the overload indicators during each month of the year, typical load curves were studied to ascertain the load which would give a hottest-spot temperature of 95 deg. C. for the given month. For example, a characteristic load of 168 per cent rated kva. caused this temperature with the 5-kva. closed-coil transformer tested. From the temperature gradient curves the temperature difference existing between the hottest spot and

Advantages and Disadvantages of the Various Overload Indicators as Determined by Tests

Type X

Advantages

1. The actuating element may be placed in the proper location in the oil.
2. The trip temperature is constant over a long period of time.
3. The signal is easily visible from a distance.
4. The visibility of the signal is not affected by dirt.
5. The indicator is very durable and rugged.

Disadvantages

1. Installation is difficult, especially on a transformer in service, unless provision is made for it before the transformer is installed.
2. The temperature lag is appreciable.
3. There is no compensation for the change in the hottest spot to oil temperature gradient with the ambient temperature.

Type Y

Advantages

1. The actuating element may be placed at the proper location in the oil.
2. The temperature lag of the indicator is low.

Disadvantages

1. The indicator is more fragile than the X indicator.
2. The overload signal may be obscured by dirt.
3. It is comparatively difficult to install the indicator on a transformer in service unless provision has been made for it previously.
4. There is a possibility that wear of the parts might change the setting.
5. The change of temperature gradient in the transformer with the ambient temperature is not compensated.

Type Z

Advantages

1. The indicators are of substantial construction.
2. Five different temperature settings may be used.
3. The receptacle for the indicator may be installed independently.
4. The temperature setting may be changed easily.

Disadvantages

1. The trip settings are inaccurate.
2. Location of the actuating element in the oil is the worst possible.
3. It is not practicable to install the indicator on transformers in service since the oil tap must be removed.
4. There is a probability that the signal would become dirty and difficult to read in service.
5. The visibility of the indicator installed on a pole transformer is poorer than that of either the X or Y indicator.

oil for this load was determined and found to be 56 deg. C.

Subtracting this temperature difference from the hottest spot temperature gave the oil temperature as 39 deg. C. existing when the hottest-spot temperature is 95 deg. C. The oil temperature so found gave the proper trip temperature setting for an overload indicator on this particular transformer during January. Settings for other months were found in a similar manner. It is interesting to note that the setting for December, which is the time of peak load on the Detroit system, is 43 deg. C. for characteristic load and 45 deg. C. for constant load with a transformer of the type mentioned. The peak-load settings are the settings that should be used if it is desired to use the same settings throughout the year.

CONCLUSIONS

In conclusion, the tests show that the hottest spot is in practically the same location in different sizes, types and makes of transformers, namely, about two-thirds of the way from the outside of the windings

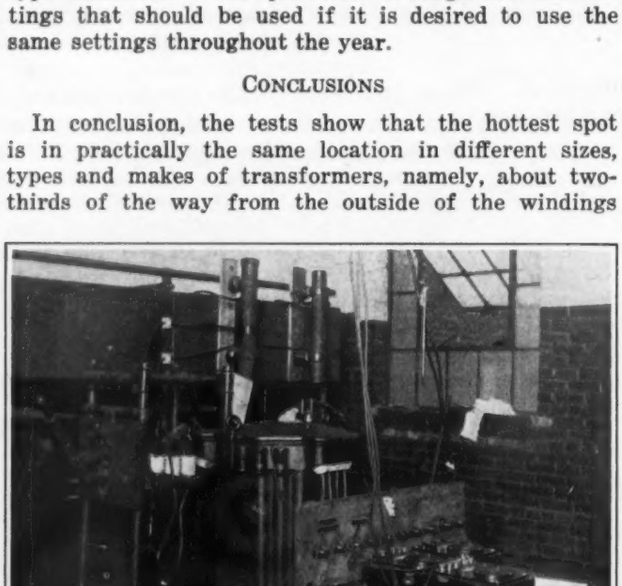


FIG. 6—EQUIPMENT USED TO CONDUCT AMBIENT TEMPERATURE RUN ON 25-KVA. TRANSFORMER

and about one-third of the way down from the top of the windings. This fact may be made use of in future studies of transformers.

The best practical location for an overload indicator is the point where the oil temperatures are highest. This point was found to be directly above the center of the windings and as close to them as possible.

The permissible temperature difference between the hottest spot in the windings and the oil temperature measured varies with the outside air temperature as well as with the amount and character of the load. It is therefore necessary to have the trip temperature setting of an indicator higher in the summer than in the winter for the same hot-spot temperature. If, however, there is a larger seasonal variation in the load on a transformer and the peak load occurs in the winter, the trip setting may be adjusted to indicate properly in cold weather and the summer load would probably not be high enough to trip the indicator even with the lower setting.

Loads considerably in excess of the rated loads may be safely carried by distribution transformers under average out-of-door ambient temperatures. The temperature of the hottest spot in the windings is the only factor limiting the amount of load which may be applied. If an overload indicator can be made to indicate when a dangerous temperature exists in the windings, the load on a transformer may be allowed to increase until the indication is given without reference to the capacity of the transformer.

LIMITATIONS OF OVERLOAD INDICATORS IN PRACTICAL OPERATION

The foregoing is an abstract of a report on the tests described. While the conclusions are logical and may be applied in the practical operation of transformers, the use of overload indicators as a means of determining dangerous temperatures in a transformer imposes certain limitations which may in some cases make it difficult to justify their adoption. In view of the fact that the Detroit Edison Company has not made any extensive use of these devices, it would probably be wise to give some of the reasons why it has been thought advisable not to use them.

In the first place, it has been the practice in Detroit for a number of years to bank nearly all of the transformers into secondary networks. The transformers are fused on the primary and secondary sides and no fuses are used in the network. If a fuse blows on a transformer, its load is carried by adjacent transformers until the fuse is replaced. If the adjacent transformers were already carrying a heavy overload, this increase might very often be enough to do serious damage before the condition was discovered, with the danger of a complete shutdown of the secondary bank or network. For this class of service therefore it is not possible to take full advantage of the overload possibilities of the transformers and if overload indicators were used they would have to have a low temperature setting.

LOAD TESTS AND THEIR VALUE

Secondly, a systemmatic load test is made each winter of the load on every transformer in the city. While these tests do not often catch the peak load, they usually give a pretty fair average peak for the month in which they are made, which bears a more or less definite relation to the seasonal peak. In addition to the load test on the transformer, a test is made at the same time on the secondary main on one side of the transformer to determine how much of the load is going in each direction from the transformer. These tests give information which is very useful in the intelligent rearrangement of transformers to take care of increases in load, and it would be impossible to obtain such information by the use of overload indicators.

It is felt that the information obtained in the tests is valuable as a guide to the economical operation of transformers, no matter what the method of overload determination, and that such information is almost necessary for the intelligent use of overload indicators

The tests and the study of transformer temperatures gave much valuable data on transformers as well as determining the field of overload indicators.

Relative Plant Values of Coal

Heating Values, Moisture Content, Ash Content and Fusing Temperature as Determined by Laboratory Test, in Conjunction with a Grading Table, Can Assist in Comparing Fuel of Different Quality

By KENNETH M. HOLADAY
Chemical Engineer Central Illinois Public Service Company, Springfield, Ill.

STEAM power-plant engineers are consistently endeavoring to develop energy at the highest economies by adapting equipment and methods to local requirements, but true economy in the purchase of coal, the principal raw material, is not so common as it ought to be. Variations in the true value of coal are familiar in a qualitative way to any one connected with its utilization, but there is a noticeable lack of standardization in the methods of quantitatively controlling the cost of these variations.

A systematic inspection of the coal, including laboratory analyses of samples from the several available supplies, may eliminate uncertainty and assure the use of the most economical fuel at all times. A complete and well-proportioned inspection system should include (1) uniform methods of sampling coal shipments, (2) proximate analysis of samples by standard laboratory methods, including heating value determinations, and occasional ultimate analyses and ash fusion tests, and (3) uniform methods of interpreting and summarizing the data.

The first two requirements are fairly well determined by general practice. Those responsible for the sampling of the coal should by all means be familiar with the theory of sampling and the reasons for all the details and refinements required by the standard methods.*

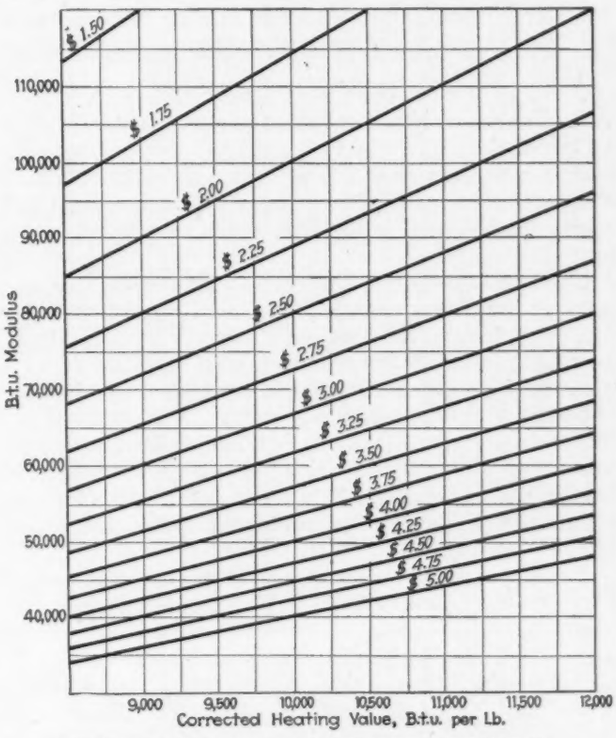
There is generally even less variation in the methods of analyzing the samples than in the sampling of the coal. This work may be done at a trifling expense in the plant or company laboratory, but if adequate facilities are not available for doing the work properly, all samples should be shipped to a commercial laboratory.

Analytical data so obtained may be used as a basis for controlling the coal supply sometimes by purchasing on contract, including penalties and premiums for variations from arbitrary standards of quality.† Where conditions have seemed to make such contracts inadvisable inspection of the coal has not often been made. Yet inspection tends to standardize the quality of the fuel and improves operating efficiency owing to the greater uniformity of combustion conditions. It furnishes data which are valuable to both the engineer and the accountant, and—the most tangible advantage of all—it may effect a direct saving in the cost of the coal by furnishing an absolute basis for the estimation of relative economies.

The figures determined by the proximate analysis and heating value tests are not infallible guides. They are simply valuable helps in obtaining a uniform coal supply economically and utilizing it efficiently. Final judgment in all cases must of course depend upon the results produced in the furnace, but it is obvious that a boiler test is too elaborate, too inconvenient and too expensive to use as a routine method of coal testing for the ordinary plant. Laboratory analyses and tests are therefore almost universally used.

WHAT LABORATORY DATA INDICATE

While the heating value, moisture and ash data are perhaps most readily used as routine measures of quality, the complete proximate analysis is essential to the most intelligent interpretation on individual coals.



NOMOGRAM THAT FACILITATES PRICE COMPARISON

Moisture‡ which is held on the surface of the coal may be driven off by simple air-drying and is called surface moisture. The remainder of the moisture is an inherent constituent of the coal and can be driven off only by drying in an oven above 212 deg. Fahrenheit. It is an undesirable constituent in coal from the standpoint of theoretical heat generation. Even so, it is often necessary to increase the moisture content by generously sprinkling the coal in order to make it stick together if it is very fine and moderately dry. Other-

*Convenient sources of this information are Bulletin 116, U. S. Bureau of Mines, "Methods of Sampling Delivered Coal"; Technical Paper 133, U. S. Bureau of Mines, "Directions for Sampling Coal for Shipment or Delivery," and Standards of the American Society for Testing Materials, 1921.

†Bulletin 29, Illinois State Geological Survey, "Purchase and Sale of Illinois Coal on Specification"; Bulletin 116, U. S. Bureau of Mines, "Methods of Sampling Delivered Coal and Specifications for the Purchase of Coal for the Government"; E. E. Somermeier: "Coal, Its Composition, Analysis, Utilization and Valuation," McGraw-Hill Book Company.

‡"Laboratory Sampling and Analysis of Coal," A. S. T. M. Standard D22-21.

wise it would be swept up the stack by the draft before it became ignited.

High moisture content in coal materially increases transportation costs. Furthermore, each per cent of moisture in the coal entering the furnace absorbs 10 to 20 B.t.u. per pound of coal burned. This loss depends upon stack temperatures, it being greater for the higher temperatures.

Volatile matter is almost entirely combustible when burned under suitable conditions. Under imperfect combustion conditions some of the gas or volatile matter is cooled before it is completely burned. The carbon from this incomplete combustion is then deposited as soot or carried out with the stack gases, making black smoke.

Ash, or the mineral solids which will not burn, is an undesirable constituent of coal. It increases handling and transportation costs, as does moisture, and adds further handling expense by remaining as refuse after the coal is burned. The heat wasted through absorption by the ash is not so important since each per cent of ash absorbs only 2 to 4 B.t.u. per pound of coal burned, the amount of the loss depending upon the temperature of the refuse leaving the grates. The greatest objection to ash is usually the clinker trouble it causes. If there is iron present, the color will be reddish to brown. A high sulphur content in coal giving such ash would indicate considerable clinker trouble. The sulphur content would not have this significance if the color of the ash were bluish or gray.

Fixed carbon is completely combustible and usually furnishes most of the heat when the coal is burned in a boiler furnace. In the fuel bed fixed carbon burns to carbon monoxide gas, CO, with the liberation of heat. The carbon monoxide then unites with more oxygen and burns to carbon dioxide, CO_2, with the liberation of more heat.

Sulphur is usually considered as an undesirable element in coal. However, it is combustible, and each per cent of sulphur furnishes 45 B.t.u. per pound of coal burned by burning to sulphurous acid gas, SO_2. Corrosion by this gas is not appreciable under boiler-furnace conditions, although it sometimes is in an economizer. There is a real objection to sulphur in that it usually occurs in coal as iron sulphide, which when burned leaves iron in the ash. This tends to lower the melting point of the ash considerably, thereby increasing clinker troubles.

Hence, an important supplementary test is that for the ash-fusion temperature.‖ Methods for making this test have recently been standardized so that the results are consistent, reliable and readily obtained.

Ashes which melt at about 2,400 deg. F. or below are considered to be clinker-forming. Most Illinois coals fall in this class. Clinker trouble is naturally greater with lower ash-fusion temperatures, and a low ash-fusion point may therefore rule out of consideration a coal of high quality in other respects. The type of stokers, rate of firing and other local conditions are, of course, very important factors governing the formation of clinkers.

UTILIZATION OF DATA FOR COMPARISON OF QUALITY

It is often desirable to judge shipments of coal from various sources as to comparative quality for use in steam plants. The laboratory analysis may be used as a fair basis upon which to make such judgment. For this purpose the heating value and the moisture and ash contents are commonly used in conjuction with a grading table to classify coal with respect to each of these items. Where routine ash-fusion tests may be made, that determination might well be included in the grading system. The accompanying table of limits indicates the method of making systematic comparisons by means of the analytical data. These limits are arbitrary and must be determined by experience governed by local conditions. The numerical grades are used to indicate the classification, 5 representing excellent, 4 good, 3 fair, 2 poor, 1 very poor, 0 worthless.

HEATING VALUE OF VARIOUS GRADES OF COAL

Grade	Moisture	Ash	Heating Value
5	Below 5.0	Below 5.0	Above 11,500
4	5.0—10.0	5.0—12.5	10,500— 11,500
3	10.0—15.0	12.5—17.5	9,500— 10,500
2	15.0—20.0	17.5—25.0	9,000— 9,500
1	20.0—25.0	25.0—30.0	8,500— 9,000
0	Above 25.0	Above 30.0	Below 8,500

The average quality of the coal is determined by averaging the grades rated by the various items shown on the table, provided all grades are above zero. Should the grade on either moisture, ash or heating value be zero, then the coal would generally be considered in the zero class, practically worthless, and not usable under ordinary conditions.

The following example illustrates the use of the grading table in judging a coal which has been analyzed:

	Analysis	Grading
Moisture	7.50 per cent	4
Ash	27.50 per cent	1
Heating value	9,250 B.t.u.	2
Average		2.33

The quality of this coal would be judged as poor to fair. The foregoing method is approximate, as no attempt is made to assign different degrees of importance to the three items of the analysis used. The method is, however, convenient and may be readily applied in a general way to measure the quality of a coal and to predict the probable efficiency of its utilization.

For combining quality with purchase price to determine the relative economy of each coal available to a given station, the method of converting the results of the laboratory report into terms of heat units purchased for one cent is often used. This expression "B.t.u. purchased for one cent," or "B.t.u. modulus," summarizes and combines the two variable factors, quality and price and provides a reasonably fair basis for comparison. In calculating the B.t.u. modulus, the heating value, on the "as received" basis, of one ton of coal is divided by the price per ton, in cents. The price should be corrected by adding an amount depending on the ash content, thus accounting for the cost of handling ashes. The correction usually assumed for this purpose is one-half the ash content of the coal, in per cent. This is equivalent to a charge of 50 cents per ton of ashes. The figure used to represent price should, of course, include freight charges. The various terms used in the calculation may be symbolized as follows:

M = B.t.u. modulus (net B.t.u. purchased for a cent).
H = heating value (B.t.u. per pound), "as received" basis; i.e., corrected for moisture.
P = delivered price, cents per ton.
A = ash content, per cent.

The B.t.u. modulus is then expressed as follows:

$$M = (H \times 2{,}000) \div (P + \tfrac{1}{2}A)$$

‖"Test for Fusibility of Coal Ash," A. S. T. M. Standard D22-23.

A collinear nomogram§ may be used for rapid calculation of the B.t.u. modulus if constructed on a scale that is sufficiently large so that the smallest divisions on the B.t.u. modulus line may represent 250 B.t.u. or less. An elementary diagram similar to the accompanying chart may be constructed if this type of chart be preferred.

The following example illustrates one method of using the B.t.u. modulus to compare the true value of one coal with that of another:

COAL A	COAL B
H = 9,400 B.t.u.	H = 10,800 B.t.u.
A = 20.00 per cent.	A = 18.00 per cent.
P = $3.45.	P = $3.70.
$M = \frac{9{,}400 \times 2{,}000}{345 + 10}$	$M = \frac{10{,}800 \times 2{,}000}{370 + 9}$
= 52,958.	= 56,992.

Now, if these two coals were judged only by the price per ton, A would show a saving of 25 cents per ton over B. But the B.t.u. modulus indicates that coal B costs less in the long run than does coal A, since 21,000,000 B.t.u. (370 × 56,992) is obtained in a ton of coal B. By dividing this quantity by 52,958 (B.t.u. modulus of coal A) it is found that $3.98 is the cost of 21,100,000 B.t.u. in coal A. If coal A were purchased, there would be therefore a loss of 28 cents per ton instead of the apparent saving of 25 cents.

The example just cited is not an extreme case. The B.t.u. modulus of Illinois coals often represents differences of more than $1 per ton in the true value of the coals, even though the uncorrected prices be nearly the same.

It is, of course, not to be assumed that coal should be purchased only on laboratory analysis and empirical calculations. In the commercial application of the data secured by inspection a thorough knowledge of the situation is necessary. Market conditions and transportation facilities must be considered, and it is hardly possible to escape using personal judgment on these points.

§"Why Coal Should be Bought on a B.t.u. Basis," *National Engineer*, Vol. XXVII, September, 1923, p. 432. Hewes & Seward, "The Design of Diagrams for Engineering Formulas," McGraw-Hill Book Company.

"Electrics" in Central-Station Service

Definite Field of Activity Indicated—Little Serious Study Has Been Given by Central Stations to the Allocation of Their Own Transportation Vehicles—Survey Shows Electric Trucks to Be Neglected

THIS is the second of a series of articles dealing with the transportation equipment of central-station companies. Twenty-five representative companies were selected in various parts of the country and were asked to supply information and data to show the practices followed and the types of equipment used for transportation service. As a result of the information obtained articles on gasoline trucks, electric trucks, passenger vehicles and special equipment will show the results of the survey.—*Editors.*

THOUGH the electric truck is well adapted to some transportation needs of central-station companies, it has not been used very extensively. Replies from twenty-four companies in all sections of the country to a request for information about their transportation departments show that only 358 trucks out of a total of 2,121 used are electric, and a further significant fact is that three companies of the twenty-four use 303 of the 358 electric vehicles. Thus the ratio of gasoline to electric trucks per company on an average basis is over five to one. Table I shows the use of gasoline and electric trucks by individual companies. These results lead directly to the conclusion either that the central stations are apathetic or uninformed about electric trucks or that the use of this type of vehicle is not practicable for their transportation needs. A study of the properties considered shows that as a general rule no decisive data have been available on transportation needs or vehicle performance which would make it possible to allocate gasoline and electric trucks to their proper fields of activity. Of two companies operating under practically identical conditions in cities of the same size, one may use a large number of electric trucks and the other none, and in nearly all cases costs and records in transportation departments are too meager to support intelligently the executive decisions for the selection of transportation vehicles.

A central-station property needs many vehicles to move men and materials, and there is a wide divergence in operating conditions found on different properties. For each service requirement the vehicle selected seems to be determined primarily from a study of its usefulness for transportation and secondarily from a study of costs. The quick and reliable maintenance and expansion of the central-station property is the guiding thought followed.

A broad classification of service conditions may be made which covers the field of service activity and indicates the weight, speed and operating conditions to be met by transportation vehicles of the truck type. This classification is as follows:

1. High-speed, long-distance, infrequent-stop movements of men or materials. Transmission-line patrol, emergency trouble work and maintenance and movements from headquarters to outlying stations and substations are typical examples of this class of service.

2. Intermediate-speed, long-distance and short-distance, intermediate-unit-load and rather infrequent-stop movements of men or materials. Distribution system maintenance and construction work are typical of this class of service.

3. Low-speed, short-distance, frequent-stop movements of men or materials. City distribution maintenance, particularly on underground work in congested districts, servicing, short hauls at the power house, warehouses and freight stations and merchandise de-

liveries are typical examples of this class of service. These classifications exist on most properties although the extent of the area in which traffic is congested will vary and the terrain over which movements occur will be widely dissimilar. In the first class the gasoline truck is virtually without a competitor as a transportation agency. It has speed and ability to go long distances without replenishing its supply of energy, and it operates economically while running at high speed. In the second division both gasoline and electric trucks can be used, and the selection of specific vehicles depends upon a detailed comparative study of the specific service requirements. But in the third class of service the electric truck is a splendid transportation agency, particularly on level streets in large cities, because it has been designed for these operating conditions.

WHY THE ELECTRIC TRUCK HAS BEEN NEGLECTED

Many reasons are given for the apathetic response to suggestions that electric trucks are excellent transportation agencies for these special services. In the first place, the electric battery vehicle had a premature development and came into use as a transportation agency, embodying many false economic and engineering ideas and conceptions. In the early days it was difficult to obtain a first-class battery, a well-designed motor, a suitable control and transmission system and, moreover, charging methods and charging stations were poor and little developed. Even drivers who could operate an electric truck intelligently and with an understanding of its possibilities and limitations were few. The result was dissatisfaction and failure and the promulgation of false conceptions which persist to the detriment of the electric vehicle even today. Yet it must be admitted that it is as fair to compare the gasoline truck of today with the vehicle of 1905 as it is to compare electric trucks of the corresponding years. The former difficulties with electric trucks have been overcome and it is a first-class transportation agency in every respect—dependable, reliable and economical in its sphere of activity. But as a first step toward bringing about its greater use the electrical industry apparently needs engineering education regarding the adequacy of the vehicle.

The other great handicap to the use of the electric vehicle is a lack of understanding of its proper fields of application. It is a low-speed vehicle because it was designed for this kind of service. Its low speed is an asset, not a liability, in considering it for service conditions for which it was designed.

It should not be used in high-speed service, but it has a great field of usefulness in areas of congested traffic in urban districts, where time is wasted in acceleration and retardation and it is impossible for vehicles to move more rapidly than the average traffic speed. This average traffic speed is much less than the normal operating speed of the electric vehicle.

It should replace all horse-drawn vehicles used in this service because it can operate at a faster speed than horses, costs less per unit weight hauled and has more power per unit of traffic area. It has other wide fields of application in tree trimming, merchandise deliveries, certain kinds of line maintenance and construction work, service and meter work, and heavy haulage around a power station or warehouse.

Thus every property has an opportunity to use electric trucks as serviceable, economical and efficient vehicles for certain of its transportation services. Energy for charging is available at cost, the advertising value is considerable, and the aid to the sale of electric trucks to industrial clients is very material, for aside from the sales argument associated with the use of electric trucks by central-station companies, charging stations and skilled mechanics will be developed which will be invaluable to other users of electric vehicles. Thus on a policy, cost, efficiency, weight and service basis the electric truck has a distinct field of application in central-station transportation service.

TABLE I—NUMBER OF TRUCKS USED AND DATA AVAILABLE

Company	Number of Trucks Electric	Gas	Average Life, Years Electric	Gas	Costs Recorded	Costs Given Electric	Gas
A	47	66	10–15	4–6	Yes	No	No
B	0	16	..	..	Yes	....	Yes
C	0	85	..	4	Yes	....	Yes
D	0	22	..	2–5	No	....	....
E	0	60	..	3–10	Yes	....	Yes
F	0	40	..	3–10	Yes	....	Yes
G	5	101	..	....	Yes	Yes	Yes
H	0	138	..	2–10	Yes	....	Yes
I	1	26	..	8	Yes	Yes	Yes
J	15	18	12	3	Yes	....	....
K	6	161	..	....	Yes	....	....
L	0	60	..	4–11	Yes	....	Yes
M	2	18	10	5–10	Yes	No	Yes
N	0	13	..	....	Yes	....	....
O	0	5	..	4–9	Yes	....	Yes
P	3	37	10	5	....	....	....
Q	3	10	10	6	....	....	....
R	0	110	..	4–8	....	....	....
S	3	18	10	6	Yes	No	Yes
T	6	592	..	5–10	Yes	No	Yes
U	4	32	..	....	Yes	....	....
V	7	14	10–12	5	No	....	....
W	27	106	..	....	....		....
X	229	25	10	2	Yes	....	....
Total,	358	1,763					

TABLE II—COSTS OF ELECTRIC TRUCKS OF ONE COMPANY*

Tonnage	Number	Make	Depreciation per Mile	Operating and Repairs per Mile	Average Mileage on Which Lists Are Based
1	1	Commercial	0.045	0.093	3,500
2	1	Commercial	0.060	0.082	5,000
2	1	Walker	0.060	0.078	5,600
1	1	Ward	0.045	0.065	6,000
¼	1	Steinmetz	0.045	0.081	5,000

* In use one year and company pleased with performance and costs. The costs have been 50 to 70 per cent of gasoline trucks operating over the same routes.

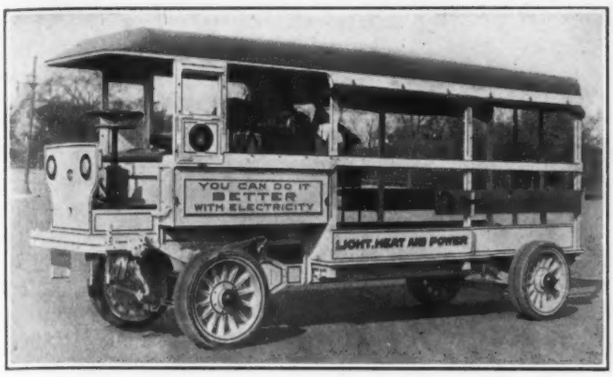
TABLE III—DISTRIBUTION OF TRUCKS

	Walker	General Vehicle	Commercial	Steinmetz	Ward	Miscellaneous
Number of companies	10	7	4	6	3	3
Number of trucks	273	49	12	9	9	5

MORE DEFINITE INFORMATION NEEDED

It is unfortunate that the replies received from the companies operating electric trucks give little positive or detailed information. Apparently data are not kept which will convince others. Opinions rather than facts are given in support of service success, and in many cases bias or prejudice for or against electric trucks counteracts the effect of the data submitted. It is surprising to find that the most complete data on electric vehicle performance have been published by industrial owners and not by central-station companies.

Statements regarding the use of electric trucks in central-station service can be cited to indicate the wide differences in opinion that now exist and the effect of local conditions upon the results obtained. The following comments cover the various shades of opinion ex-



ILLUSTRATING THE ADVERTISING VALUE OF A CONSTRUCTION TRUCK

pressed by different companies which have had experience with electric trucks:

1. We have been using electric trucks in the city for various purposes for a year and are more than gratified with the performance they are giving. The average cost per mile of these trucks has been from 50 to 70 per cent of the cost of gasoline trucks operating over the same routes. The ease of control and simplicity of construction is a further factor in favor of electric trucks.

2. We believe electric trucks are admirably adapted for city needs and that the cost per ton-mile is much less than with gasoline trucks.

3. We tried out electric trucks and found their operating costs much lower than was the case with gasoline vehicles, but owing to our distance from manufacturers carriage charges, repairs and renewals made the final operating costs equal to or greater than costs for gasoline cars, and therefore we discontinued the use of electric vehicles.

4. We bought some electric trucks years ago without regard for their adaptability to service requirements, and they were heavily overloaded and rapidly deteriorated. Our newer electric trucks have been adapted to service conditions and are used on the basis of an indefinite life through renewal of batteries and other parts as required. We are not very enthusiastic over the costs involved in electric truck operation as compared with the costs involved in using gasoline trucks. Service conditions in the city are governing elements in the use of electric vehicles.

5. We have used some electric trucks in the city for tree trimming for from ten to eighteen years and have found them reliable and economical, but have been unable as yet to determine their life. A Steinmetz truck has been used in underground construction service for more than two years with great satisfaction and with the exception of a repaired shaft has required no expenditure for maintenance.

6. We find electric trucks splendidly adapted to particular services and the cost about a "stand-off" as between electric and gasoline vehicles.

7. Because we operate in a city having level and fairly good streets and have frequent stops, we have adopted electric trucks for our transportation service. We believe that electric trucks are the best form of urban transportation, being efficient, economical and reliable.

TRUCK USES OUTLINED

Some of the uses to which electric trucks are put on the several properties are tree trimming, meter servicing, lamp deliveries, cable hauling, manhole and duct rodding service, transportation of laborers and cable splicers, supply deliveries to construction crews, stockroom freight and heavy delivery service, merchandise deliveries, line construction and maintenance work and miscellaneous hauling. Thus a wide variety of duties can be listed for which the electric truck can be used to advantage. Despite this fact it must be said that it has not been capitalized upon to any great extent by central stations.

CONCLUSIONS

Before the electric truck comes to be used more widely in central-station transportation service an educational campaign must be carried on. This campaign should emphasize two things—(1) the adequacy of the electric truck of today as a reliable transportation vehicle built and designed along proper engineering lines, (2) the itemization of cost and performance data to convince prospective customers of the economic place of the vehicle in transportation service. These data should be agreed upon by central stations and adequate records should be kept over a series of years.

A co-operative effort should be made along these lines, and all available data should be digested and presented in a form which is convincing and understandable. The truck will fail or succeed on its merits for given service conditions, and data in detail on cost and performance should be made known as foundational material in securing progress. The electric truck has an important place in central-station service, and yet it will occupy this place slowly or not at all unless real effort and true information are made available to the industry. A definite first step lies in the direction of getting into operation a cost and performance record system uniform for the several properties using electric vehicles.

THIRTY-ONE HALF-TON ELECTRIC TRUCKS ARE USED BY ONE PROPERTY FOR METER INSTALLATIONS

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Power-Factor Correction as a Financial and Commercial Problem

To the Editors of the ELECTRICAL WORLD:

It is very gratifying to see the stand taken by the ELECTRICAL WORLD in the editorial on the above subject on page 105 of the July 19 issue. I think it is very much to the point. One editorial, however, is not sufficient, and if you are really sincere in what you say, then you will have to pound on the idea for months and perhaps years in order to get it across. The ELECTRICAL WORLD has always seemed to think that it has done its duty when it has once put its view on any point before its readers; it then tells the manufacturers that they must tell the story over and over again in order to get it across. That should be equally true for the editorial columns of the paper. Continuity of purpose and persistence of effort are required to change any deep-rooted practice in an established and flourishing industry.

Central-station executives have been afraid to face the problem and have passed the responsibility to their engineers, who in turn have been trying to reach a solution through the designers of the apparatus used on their lines. Manufacturers' engineers have done their share. They have developed apparatus for power-factor correction and have developed high-power-factor motors, but the central-station industry has not done its part in making its rates such as to encourage customers to buy high-power-factor apparatus. Low-power-factor motors are cheaper to build than high-power-factor motors as a general rule unless some freak design is developed in which efficiency is unduly sacrificed for power factor. As much as the apparatus manufacturers want to help the central station and as much as their business depends upon the prosperity of the central stations, this all means nothing if the manufacturer cannot sell his product. Instances are available where manufacturers have developed equipment at the request of central stations, and yet when the development was placed on the market the central stations did little if anything to help get it applied and sold to users.

Some years ago one of the electrical manufacturers brought out a unity-power-factor single-phase repulsion motor. It was applicable to a field where the power factors are notoriously low; while the individual units are small, the aggregate capacity is large. The central stations complimented the manufacturer on his product, but in general they took no practical steps to encourage their customers to buy this particular type of motor. It, of course, cost appreciably more than the lower-power-factor motors on the market and the central-station customer said, "Why should I pay more for my motor just to please the central-station company?" and he did not pay more for his motor. The result was that the motor was virtually taken off the market, or at least it was not manufactured and sold in appreciable quantities compared with competitive types of motors.

Central-station companies seem to be coming more and more to the adoption of power-factor clauses for their large customers, but this does not help the situation among the myriad smaller power users whose aggregate load mounts up in capacity but who could not understand the application of a power-factor clause even if it were commercially practicable, from the standpoint of central-station building, to sell energy upon such a basis. Unless the central station does make it financially attractive for its small power customers to buy high-power-factor apparatus, it will not get such apparatus on its lines. The simplest way to meet this situation as I see it is by the sale of service on a kilovolt-ampere-hour basis. I admit this has some technical disadvantages and that perhaps some combination of kilovolt-ampere demand and kilowatt-hour energy charge, or vice versa, might be more accurate technically; but to my mind the loss in simplicity would be infinitely greater than any gain from the standpoint of equitable metering. There is a limit to the extent to which it is practicable to carry rate making. Theoretically the customer near the power station should get service cheaper than the one miles away, but practically this is an untenable principle. Practical considerations modify theoretical principles, and past experiences with rates must be weighed and used.

A change from the kilowatt-hour to a kilovolt-ampere-hour basis, with a reduction in price depending upon the average power factor of the system, would give the utility opportunity to get a great deal of favorable publicity on account of the reduction in price of service, and those customers whose bills did show an increase could be told how this could be reduced by the proper corrective equipment.

ONE WHO HAS SERVED BOTH UTILITIES AND MANUFACTURERS.

Professors and Practicing Engineers

To the Editors of the ELECTRICAL WORLD:

The letter from J. B. Whitehead in your issue of July 19 seems to admit quite frankly one of the suspicions that have been in the minds of the last "generation" of engineering students, meaning thereby those of us who attended about thirty years ago. That is whether some of our largest and best known schools are willing to give our sons the personal type of training we received or whether we are asked, or permitted, to shoot them through steam-driven hoppers run by the water boy while the licensed engineer is engaged in higher activities.

The writer takes particular exception to the statement that university laboratories are not intended for undergraduate benefit, and that the more competent professors are "burdened" by having to give undergraduate instruction. It seems to me that the question of common honesty should be given more consideration in perhaps most of our present educational systems. A school which purports to teach its students should expend its funds and faculty primarily and nearly exclusively in teaching those it matriculates. A school can honestly devote its best facilities to the things beneficial to graduate students if it is a graduate school, but not otherwise.

Admitting the pressure of student applications, and carefully avoiding further reference to the social trouble, the writer is one of those who sees no merit in the increased size of our schools and universities nor in many of the "new thought" additions and subtractions from a sound fundamental education.

New York City. R. D. COOMBS.

Central Station and Industrial Practice

Progress of Construction and Trend of Cost

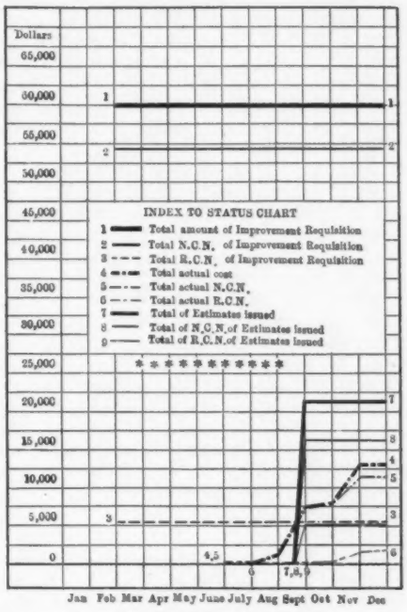
By John Oram
Engineer Dallas (Tex.) Power & Light Company

IN ANY construction work many regrets can be avoided if the relative progress of the work is carefully checked periodically while it is going on to avoid any part of it being held up by any other part, and if the actual cost is checked periodically to see that it does not run above the estimate without some good justification.

Two types of reports have been found very helpful on the Dallas Power & Light Company's system in meeting these requirements. One of them is the graphical comparison at periodic intervals of the total amount of the improvement requisition, the total actual cost and the total estimates issued. The ordinates are expressed in dollars and the abscissas in months or days, depending upon the time required to complete the job.

The other type, labeled as the construction status on progress charts, subdivides each piece of work into its major component, shows the estimated and actual date of starting the work, the proportion of each piece of work completed as of any date, the estimated and actual date of completion and the estimated cost. It will be observed that each item is divided into "new construction" and "reconstruction."

By watching the progress charts the work can be so divided that it will keep as near as possible to the prearranged line. Compared with the budget-control sheet, this information also enables the supervising engineer to watch the actual costs and see that they do not exceed the estimates.



MEANS OF CHECKING IMPROVEMENT REQUISITIONS AGAINST ACTUAL COST AND ESTIMATES AS WORK PROGRESSES

DALLAS POWER & LIGHT CO.

I.R.No. 363 ENGINEERING DEPARTMENT CONSTRUCTION DIVISION Date

CONSTRUCTION STATUS & PROGRESS CHART

Subject IMPROVEMENTS TO SUBSTATIONS LAST SIX MONTHS 1923

Date Started 8-13-23 Est. to Complete 3-1-24 Cost Total $3947.00 N.C.N. $2947.00 R.C.N. $1000.00

Control Sheet No	Description of Work	Date of Starting Estimated / Actual	Per Cent Complete 25 50 75	Date of Completion Estimated / Actual	Estimate Cost Total	N.C.N.	R.C.N.
1	Installation of 13 Kv. Trans. Leads in Conduit at Oak Cliff Substa.	9-26-23		11-15-23	$446.00	$333.00	$113.00
2	Installation of Disc. Switch in 13 Kv. Bus at Oak Cliff Substation	9-26-23		12-31-23	279.00	208.00	71.00
3	Connecting Service Trans. to 4 Kv. Leads at Oak Cliff Substation	9-26-23		2-29-24	285.00	213.00	72.00
4	Installation of Test Panel for St. Lighting Circuits O.C. Substation	9-26-23		2-29-24	353.00	264.00	89.00
6	Installation of Test Panel for Lighting Circuits E.D. Substation	9-26-23		2-29-24	342.00	255.00	87.00
7	Connecting Service Trans. to Aux. Bus at E.D. Substation	9-26-23		2-29-24	319.00	238.00	81.00
9	Installation of Control Wiring in Metal through J.S. Substation	9-26-23		1-30-24	570.00	0.00	570.00

CONSTRUCTION PROGRESS CHART FACILITATES KEEPING ALL WORK MOVING IN PROPER ORDER

Storing Coal 30 Ft. High Without Danger

BITUMINOUS run-of-mine coal is stored in piles 30 ft. high and allowed to remain in storage for a long period of time, without danger of spontaneous combustion, by the Delaware County (Pa.) Electric Company at the Chester station. The coal is received in cars, and when necessary these cars are placed over a hopper and two Link-Belt portable belt conveyors. These portable belt conveyors carry the coal up from the hopper to barges, in which it is towed to other stations, or else to the unloading towers of this station, where it is lifted overhead to the coal bunkers and interior coal-handling equipment.

Not only do these belt conveyors handle all the coal used by the Chester station, but they also handle the stored coal for other Philadelphia Electric Company stations which are supplied by barges loaded from this point. It is an unusually large amount of work when it is remembered that during the course of a year these conveyors handle as much coal as would ordinarily be handled by a retail coal company in many years of business.

The two conveyors are equipped with 24-in. belts, 1½-in. high cleats and sideboards. They will handle a 50-ton car of coal in about twenty minutes. In addition to handling coal from the hopper to the barges, however, they are used to handle ashes and to store and reclaim coal beyond the reach of the crane booms.

When coal is not needed for immediate use, a crane equipped with a 1½-yd. grab bucket stores it out in piles reaching a height of 30 ft. In order to prevent internal heat or spontaneous combustion coal is delivered rather evenly over the

piles in successive layers 3 ft. or 4 ft. deep. Each layer is packed down with a heavy roller drawn by a crawler-tread tractor. The roller seals each layer by its crushing or packing action, which prevents the entrance or circulation of air. Coal that has been stored to a height of 26 ft. to 30 ft. and allowed to remain in storage undisturbed for a period of two years has been found, upon inspection and reclamation, to be entirely free from internal heat.

Overhead Distribution Construction

Standardized Practice as Developed and Used by the
WEST PENN POWER COMPANY, PITTSBURGH

Tree Trimming

TREES which will interfere with the operation of a line shall be cut at the ground whenever the necessary permission can be obtained. All other tree branches which are likely to interfere with the lines should be cut away if the necessary permission can be obtained. When permission to trim cannot be obtained, the interfering branches may be avoided in some cases by the use of alley arms.

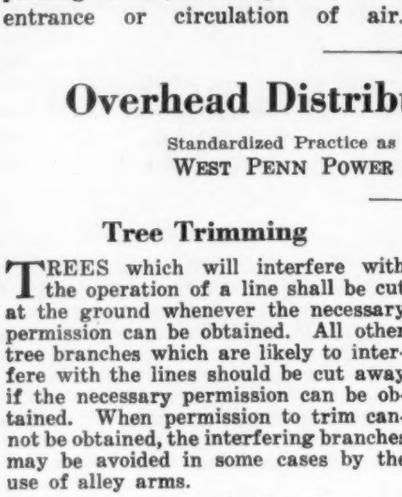

B
A
C
B
A
To Remove a Heavy Limb
Make first cut at A, then second cut at B, continuing this cut until limb falls
Make third cut close to trunk, at C, to remove stub; paint the scar with coal tar
E
D
Limb was cut at D; it should have been cut at E; decay works inwardly
A pruning wound as made at C, heals perfectly
F
G
Treat bruise F, as at G, by cutting away injured tissue, leaving surfaces and edges smooth, and painting with coal tar

FIG. 85—CORRECT METHODS OF TRIMMING TREES INTERFERING WITH LINES

Most trees are oval in outline, and in trimming their shape should be preserved as much as possible. If care is given each year, branches which have a tendency to grow in the wrong direction can be curbed and interruptions will be less frequent. The minimum amount of trimming should be done in the spring and summer, leaving the heavy work for the fall. Start at the top of the tree to trim and continue in a downward direction. When trimming back branches the cut should be made about an inch above a strong bud or small branch which on development will grow in the desired direction. Remove all dead wood.

In sawing off limbs of any size care should be taken to prevent splitting and tearing of the bark below the cut. To do this two preliminary cuts shall be made about a foot from the base of the trunk or limb, as illustrated in Fig. 85. Make a cut from below and then saw off the limb beyond the lower cut. The final cut is then made and sawed evenly to the trunk or limb from which the stub projects.

The use of an axe in tree trimming should be limited to the removal of sprouts, dead limbs and small branches which can be cut off with a single blow. The saw should be used in removing larger limbs, since it leaves a smooth surface and allows the wound to heal more quickly. After removing a limb more than 2 in. in diameter it is necessary to apply some sort of a dressing to the surface of the scar in order to prevent the entrance of decay before a new callous overcaps the wound. An application of thick coal tar will do this effectively.

Do not climb trees with spurs. A ladder is much more effective and does not injure the tree. Before climbing a tree judge its general condition. Take precautions on trees with soft and brashy wood, avoiding diseased limbs, or those filled with holes or knots. It is best to use one man on the ground to direct the trimming and shaping of the tree. Size up the tree from all sides before and during trimming. Where possible get the owner to supervise the trimming.

Utilizing Discarded Fire Brick

WHEN furnace walls are rebuilt or repaired many broken bricks usually accumulate which are unsuitable for replacement in any wall. Use has been made of such bricks by the Houston Lighting & Power Company, Houston, Tex., by employing a small motor-driven crusher at its largest generating station and crushing all refuse brick so it will pass through a ¼-in. mesh screen. A mixture consisting of 60 per cent of the crushed fire brick and 40 per cent fire clay is then used for repairing furnace walls. Applied with a cement gun, this mixture has been found to stay in place from thirty days to sixty days. The fine crushed brick is also mixed with fire clay to lay up the bricks, thus taking the place of mortar.

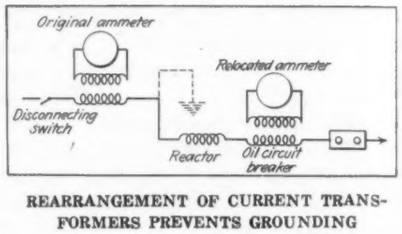
High-Frequency Currents Cause Grounds

BY R. L. FRISBY
Electrical Engineer of Stations, Kansas City (Mo.) Power & Light Company

CONSIDERABLE trouble has been experienced at times of electrical storms with breakdowns to ground on the station installation of outgoing overhead feeders on the Kansas City Power and Light Company's system.

In the former design for the first three unit sections of the switchhouse electrical layout the feeder metering current transformers were located on the line side of the reactors. The circuit and apparatus layout is shown herewith.

The conductor copper bar, leaving the current transformer, made a right-angle bend. A lightning or high-frequency potential surge coming in would result in a breakdown to ground at this bend, as shown, jumping to a ground bus located in the compartment. As the fault was beyond the transformer, that is, on the bus side of the transformer, the overload relay protection was worthless and considerable damage would result to connected apparatus.



REARRANGEMENT OF CURRENT TRANSFORMERS PREVENTS GROUNDING

From the nature and location of the faults the engineers calculated that it might be due to a high-frequency oscillating current set up between the two high impedances in the circuit; that is, between the current transformer and the reactor.

When the new switchhouse was built for unit sections No. 4 and No. 5 a change was made in the design to overcome this trouble. The current transformers were located beyond the reactors; that is, between reactors and the oil switch as shown.

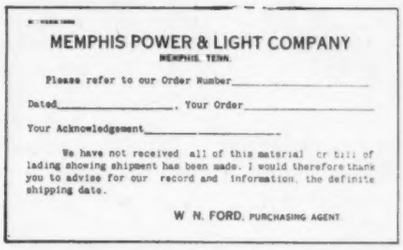
Under the new arrangement no trouble of this nature has been experienced and steps are under way to relocate the transformers on the old sections.

Co-ordinating Responsibilities of Engineer and Purchasing Agent

CONSIDERABLE difference of practice exists among utility companies regarding who shall decide what kind of equipment, material and supplies shall be purchased —the engineer or the purchasing agent. For major engineering equipment, such as turbines, generators, boilers, large transformers, etc., the make to be purchased is based almost solely on the engineering requirements, except where there is a large difference in cost between almost equally desirable equipment. However, there are items of equipment, materials and supplies on which all companies are not agreed regarding the latitude to be allowed the purchasing agent in "shopping around." These items include cables, distribution transformers, high-voltage insulators, meters, etc.

The argument favoring giving the purchasing agent a free hand is, according to comments, evidently due to a lack of appreciation of the fact that all electrical equipment called by the same general name is not the same and cannot be purchased solely on a price basis. Furthermore, purchasing on this basis without giving more consideration to the engineering angles may lead to a collection of a variety of apparatus, so that interchangeability is made almost impossible and maintenance of reserve stock becomes a costly matter. On the other hand, leaving the selection to the personal choice of engineers without regard to price is just as objectionable.

Companies which have recognized that most engineering equipment and materials must be selected for performance, avoidance of too many varieties, etc., are utilizing their engineers and purchasing agents for the work they are best equipped to handle. In other words, the engineer is used for his engineering judgment and the purchasing agent for his ability to ascertain market conditions. The engineers specify those makes which their experience has shown will give the best performance and increase the variety of equipment least. Where no one make is required, a list of preferred makes in their order of desirability are given to the purchasing agent. He in turn requests bids on that type of apparatus from all reputable manufacturers, asking for prices and deliveries. If placing the business with the lowest bidder harmonizes with the engineer's request, there is nothing further to do but place it.



MEMPHIS POWER & LIGHT COMPANY
MEMPHIS, TENN.

Please refer to our Order Number_____

Dated_____, Your Order_____

Your Acknowledgement_____

We have not received all of this material or bill of lading showing shipment has been made. I would therefore thank you to advise for our record and information, the definite shipping date.

W. N. FORD, PURCHASING AGENT

FOLLOW-UP POSTCARD ON UNFILLED ORDERS OR UNRECEIVED BILL OF LADING

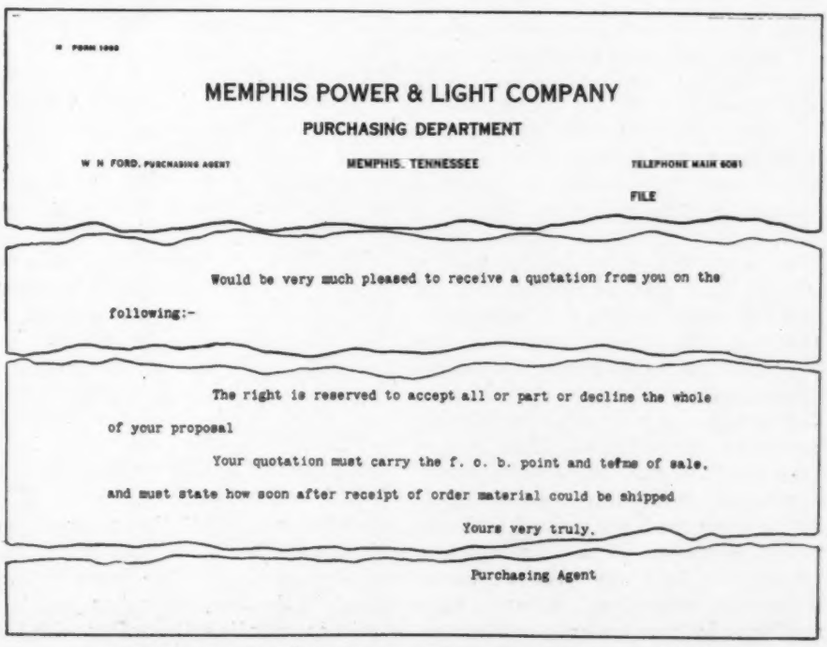
However, if it is financially advantageous to place the business for some other make of equipment, the purchasing agent submits his bids to the engineer to ascertain whether the other make is agreeable. Sometimes it is decided that the engineering requirements are paramount and that the low bids or the lowest one cannot be considered. In other cases it may be found that the engineering advantage lost by accepting one of the lower bids is not sufficient to outweigh the saving which can be effected. When all equipment is purchased on specifications, the relative authority of the engineer and the purchasing agent are not so much the subject of discussion.

The Memphis Power & Light Company is heartily in favor of the foregoing policy. Whenever equipment, supplies or material must be purchased, the purchasing agent broadcasts requests for price and delivery bids to all reputable manufacturers of the equipment sought. Rush delivery is very seldom a factor because the company endeavors to anticipate its requirements as far in advance of actual need as possible. Even pole requirements for the entire year are anticipated and orders placed for specified deliveries each month. Occasionally anticipation of needs does not agree with requirements and additional poles have to be purchased, but this is considered no disadvantage to scheduling the delivery over the whole year.

Usually the right is reserved to accept all or part of any bids so that business can be split where it is financially advantageous to do so. While this reservation might tend to make manufacturers quote a little higher price on each item, it has been the experience that many manufacturers in submitting bids will quote another list of prices which will apply if the business is not split.

By firmly adhering to the policy of never allowing a manufacturer to revise his bids and never telling what prices are obtained, the manufacturers who are accustomed to dealing with this company know that they have to submit their lowest bid in the first instance and no hard feelings are engendered such as would be caused by the opposite policy.

To discourage non-fulfillment of



MEMPHIS POWER & LIGHT COMPANY
PURCHASING DEPARTMENT

W. N. FORD, PURCHASING AGENT — MEMPHIS, TENNESSEE — TELEPHONE MAIN 6081

FILE

Would be very much pleased to receive a quotation from you on the following:-

The right is reserved to accept all or part or decline the whole of your proposal

Your quotation must carry the f. o. b. point and terms of sale, and must state how soon after receipt of order material could be shipped

Yours very truly,

Purchasing Agent

LETTER-SIZE FORM IN WHICH REQUESTS FOR BIDS ARE BROADCAST

delivery guarantees, the contracts are usually worded so that the utility has the right to buy the equipment in the open market if delivery is not made as specified, and collect the difference from the manufacturer with whom the contract was originally placed.

To facilitate following up orders the company makes use of the accompanying form of printed postal card, which is sent out if the bill of lading or all of the material has not been received. All orders are checked every five days for this purpose. If these cards bring no reply, a telegram to the same effect is sent.

Ventilating Requirements for Substations

BY ARTHUR L. GREENE
Buffalo Forge Company, Buffalo, N. Y.

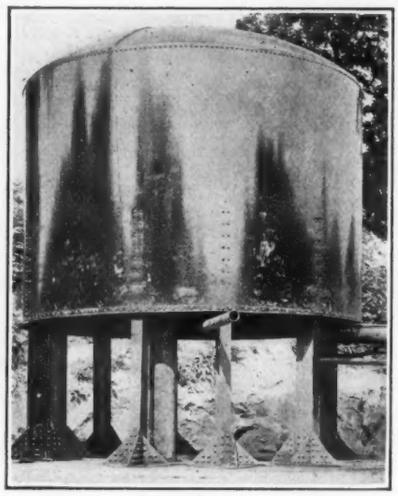
TYPICAL of the ventilating requirements for the small substation is the equipment furnished at five new stations of the St. Louis Railway Company. Each of these five stations is equipped with a No. 7½ "Turbo-Conoidal," Buffalo Forge Company exhauster fan. The fans are each connected by a chain drive to a 5-hp. motor. The capacity of each unit is 15,000 cu.ft. of air per minute against ⅜-in. static pressure. When the fans are running air is drawn into the stations through louvers in the walls which connect to ducts leading down under the converters and transformers so that the air is forced upward through these units. After passing through the fan the air is discharged through a bank of load-limiting resistors into a connection leading to the roof. Additional louvers are placed around the side walls with a ventilator in the roof for natural ventilation. These latter are left open during the winter months, when it is seldom necessary to operate the fans. Thermostats control the operation of the fans, one being installed on the converter frame and one above the resistors. When the resistor temperature rises above a certain point the fan starts up.

The claim is made that the United Railways system has been vastly benefited by the additional power furnished by these substations. From the experience gained through actual operation of the stations the opinion is held that the complete automatic control of railway substations is particularly suited to metropolitan systems.

Pneumatic Chamber for Motor-Driven Pumps

BY H. L. MILLNER
Catawba Valley Light & Power Company, Morganton, N. C.

THE pneumatic chamber shown in the accompanying illustration was designed by the author, and erected at the tannery of C. C. Smoot & Sons Company for the purpose of protecting their large motor-driven



METHOD OF PROTECTING MOTOR-DRIVEN WATER PUMPS AGAINST HIGH FLOODS

supply pump from the heavy floods of the Yadkin River, which at North Wilkesboro, the site of the tannery frequently exceeds 35 ft.

The chamber is of steel plate in the form of an inverted bowl, riveted, calked and bolted securely to its heavy concrete base through eight I-beam legs, also serving to support the direct-connected pumps and motor placed within the inverted bowl in such a way that the air trapped by a rising flood would prevent the water reaching the machinery even at the greatest recorded flood stage of the river. The principle is that of the diving bell or caisson.

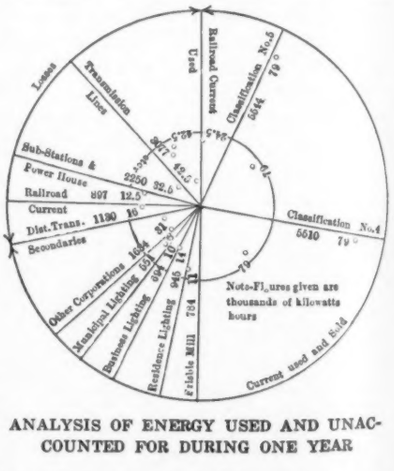
The heavy concrete base contains the intake and is arranged to separate roughly the coarser sediment of the usually turbid river water. To this end the interior of the circular structure is divided into two chambers of unequal size by a vertical partition or baffle wall extending from the top nearly to the funnel-shaped bottom of the cistern. The silt-laden water of the river flows into the smaller of the two chambers, and the suction of the pump being placed in the large chamber just below low water line, the water with its burden of sediment is caused to pass down under the baffle wall and rise through the large chamber with greatly diminished velocity, one foot per minute in this case, toward the suction of the pump. All particles having a greater subsidence rate than one foot per minute tend to gravitate to the center of the funnel-shaped bottom, where the deposit is picked up through the suction of a small centrifugal pump of dredge pattern, mounted on the main shaft above and thrown back into the river.

These devices enable an ordinary direct-connected motor-driven pumping unit to be safely operated within easy suction distance of low water and relieve the mechanical filters of the burden of handling large volumes of coarse silt where conditions forbid use of sedimentation basins.

Analysis of Power Handled by Public Utility

BY JAMES E. HEWES
Vice-President Albany Southern Railroad Company, Rensselaer, N. Y.

THE analysis of the use of electrical energy by this company shown in the accompanying illustration should be of practical interest to other companies. It was found that the ordinary operating statement with statistics did not show graphically comparisons of the amounts of energy used by the consumers and different kinds of losses of the company. The analysis generally shows energy unaccounted for, but does not show what the distribution of unaccounted-for losses



ANALYSIS OF ENERGY USED AND UNACCOUNTED FOR DURING ONE YEAR

is. The unaccounted-for energy appears to be large when shown in numerals, but when these are analyzed it is found that there are many losses that cannot be overcome, such as transformer losses, distribution-line losses, rotary losses, frequency-changer losses, etc.

Central Station Business

Power Rates to Encourage Industrial Heating Application

By Wirt S. Scott
Manager Industrial Heating Section Westinghouse Electric & Manufacturing Company

A SUFFICIENT number of industrial installations have been made of so-called standard applications of electric heat, and a sufficient amount of data have been collected to determine quite closely the cost at which power should be sold in order to compete with fuel. The comparative figures which are tabulated herewith take into consideration the cost of power plus the economic advantages resulting from the use of electric heat. They apply to average conditions found in practice. Frequently special or unusual conditions will permit of higher rates.

COMPETITIVE INDUSTRIAL HEATING RATES

Application	Gas, per 1,000 Cu.Ft.	Oil, Cents, per Gal.	Electricity, Cents per Kw.-Hr.
Bread baking, retail; small ovens	$1.00	...	2.5
Bread baking, wholesale; large ovens	1.00	...	1.5
Enameling ovens, large, conveyor type	1.00	...	2.0
Enameling ovens, small, box type	1.00	...	2.5
Tempering furnaces, small	1.00	6.0	2.0
Hardening furnaces, large	0.50	6.0	2.0
Hardening furnaces, small	0.50	6.0	3.0
Glue pots	1.00	...	5.0
Solder pots, large	1.00	...	2.0
Solder pots, small, self-contained	1.00	...	5.0
Babbitt pots, self-contained	1.00	6.0	3.5
Space heaters	1.00	...	4.0
Small industrial ovens	1.00	...	4.0
Lead hardening baths	1.00	6.0	2.0
Galvanizing tanks	1.00	6.0	1.0
Core baking, medium size ovens	1.00	6.0	1.0
Core baking, very small ovens	1.00	6.0	2.0
Vitreous enameling, large furnaces	0.50	6.0	1.0
Vitreous enameling, very small furnaces	0.50	6.0	2.5
Glass annealing	1.00	6.0	1.0
Annealing brass	0.50	6.0	2.0
Annealing steel	0.50	6.0	1.0
Armature baking	1.00	...	2.5

The data are based on an artificial gas cost of $1 per 1,000 cu.ft. of 550-B.t.u. gas and a fuel-oil cost of 6 cents a gallon. The table is not intended to show a comparison between gas and oil costs, but between gas and electricity or oil and electricity. For high-temperature operations artificial gas cannot be used economically in quantities unless purchased at 50 cents per 1,000 cu.ft. or less. Therefore for these temperatures a comparison is made with oil at 6 cents per gallon, or gas at 50 cents per 1,000 cu.ft. The power rates given are those which should compete with gas or oil on the basis of present up-to-date practice.

There has been considerable hesitancy on the part of the author in the past to present such data to the public since there are so many conditions influencing the cost of production, the cost of heating in most cases being only a small part of the cost of the finished product. There has been a sufficient number of applications to show that electric heat is commercially practical for a large number of applications; also that for others it is still yet in a doubtful or uncertain state.

These data are being submitted for the following purposes:

1. To show power sales engineers the applications on which they can most profitably concentrate their attention.

2. To prevent a loss of time on the part of power-sales engineers. Many times central stations have become intensely interested in an application that looked particularly good, only to find that at the present time they could not secure the business owing to their inability to meet competitive fuel costs.

3. To serve as an indication to central stations of the power rates required in order to meet competition.

It should be understood that the power rates given in the tabulation are not only competitive rates, but are rates at which the application should be electric. As previously noted, these rates are for conditions found in the average shop and take into consideration all factors which affects costs.

Electrical Incubation

Figures Showing Cost per Hatch, Cost per Hundred Chicks and Kilowatt-Hour Consumption for an Eighty-Thousand-Egg Hatchery

By Harold E. Bell
Electrical Engineering Department, Oregon Agricultural College, Corvallis, Ore.

THE use of electrical incubators has been found very satisfactory in commercial hatcheries because of certain important advantages they possess over other types. The electrical method is cleaner, no fumes or smoke are given off, and it is as economical as other means of heating since the greater cost of heat energy is compensated for by the lower cost of labor. Fire hazard is greatly reduced by the elimination of elements which become hot enough to ignite wood, and the cleaning and filling of lamps and the taking of numerous thermometer readings are eliminated. One of the many electrically equipped incubators on the Pacific Coast is that of the Oregon-Corvallis Hatchery at Corvallis, Ore. This plant has a capacity of 80,000 eggs at one hatching, and as it has been in operation for two years the following data and tests give a very good idea of the nature of the load and costs of hatching. The information was compiled from data taken from January 26, 1924, to May 1, 1924.

Hatchery Equipment

The plant consists of a wooden building, 44 ft. x 150 ft., which contains 131 incubators with a capacity of 612 eggs each. Double walls packed with sawdust for heat insulation are used, and the floor is covered with dirt and a layer of sawdust and shavings to reduce heat radiation. The incubator room has only a few small windows to help keep down heat losses. The building is heated by the incubators alone, and as the room is well insulated, the temperature varies over the very small range of from 60 deg. to 70 deg. F.

All of the incubators in the plant are heated electrically. Each machine is connected by drop cord from

TABLE I—COST PER HATCH IN DOLLARS

Power Cost per Kw.-Hr.	Average Room Temperature During Hatch 50 Deg. F.	60 Deg. F.	70 Deg. F.	80 Deg. F.	90 Deg. F.
1	1.00	0.80	0.60	0.45	0.35
2	1.95	1.60	1.25	0.85	0.50
3	2.95	2.40	1.80	1.30	0.70
4	3.90	3.20	2.40	1.70	0.80
5	4.85	4.00	3.00	2.10	1.20
6	5.80	4.70	3.60	2.50	1.45
7	6.85	5.60	4.30	2.95	1.70
8	7.70	6.30	4.85	3.35	1.90
9	8.70	7.10	5.50	3.80	2.15
10	9.70	7.90	6.10	4.20	2.40
11	10.70	8.70	6.70	4.60	2.60
12	11.10	9.50	7.30	5.00	2.90
13	12.60	10.30	7.90	5.40	3.10
14	13.55	11.05	8.50	5.85	3.35
15	14.60	11.90	9.10	6.30	3.60

the ceiling. Groups of six machines are served from one feeder, and each feeder terminates in a main distribution cabinet with a fuse block and a switch for protection and control. Power is supplied from a three-wire, 110-220 volt circuit. The auxiliary power in case of emergency can be furnished from a 25-kw. direct-current generator driven by an automobile engine. A protective device is installed in conjunction with the main switch service to give warning of a power failure. An electromagnet holds a battery-bell circuit open against gravity, so that when the voltage drops below normal the bell circuit closes and sounds an alarm.

Each incubator is heated by ten Petaluma Incubator Company elements, each having the following characteristics: Nine feet of No. 20 B. & S. gage alloy wire; resistance at 20 deg. F., 2.83 ohms; resistance per mil foot, 303 ohms; full-load current, 4 amp. The elements are placed in the top of the incubator and are spaced 7 in. center to center, with 6 in. from the end elements to the end of the compartment. The electrical circuit for one incubator is shown in Fig. 1. The contacts are controlled by an ether wafer thermostat. A condenser is supplied to quench the arc and prolong the life of the contacts when the auxiliary direct-current service is used.

TEST ON PLANT

A test was made on the plant for determining the cost per hatch, cost per hundred chickens and the power consumption of the machines. Three methods of test were used to obtain the desired data. In the first a graphic recording wattmeter was installed on a group of six machines to show the variation of power consumption. The chart from this meter showed that the power in each individual machine was on for very short intervals of time only. The current in no one machine remained on longer than a minute to a minute and a half except when necessary to reheat the eggs after cooling or turning. During such periods the current remained on for an hour at a time. The chart also showed that the power consumption began to drop off on the fourteenth day. This is due to the fact that the growth of the germ at this period begins to use the latent heat stored within the egg.

A characteristic curve of the kilowatt-hour consumption of one incubator during the period of incubation is shown in Fig. 2. The energy used during the first day is relatively high on account of the initial heating of both the incubator and the eggs. The daily consumption then remains constant at 4 kw.-hr. per day until the fourteenth day, when the formation of the chick reaches the stage in its development where it does not require so much artificial heating. From this time on until the chick is hatched the consumption gradually falls off and drops as low as 1 kw.-hr. per day with a room temperature of 65 deg. F.

TABLE II—PERCENTAGE OF CHICKENS HATCHED

Number of eggs	Number of Unfertile Eggs	Number of Fertile Eggs	Number of Chickens	Per Cent. of Chickens Based on Total Eggs	Percent of Chickens Based on Fertile Eggs
612	101	511	354	57.8	69.3
612	73	539	402	65.6	74.6
612	70	542	396	64.7	73.0
612	89	523	327	53.4	62.5
612	100	512	380	62	74.2
612	71	541	382	62.4	70.6
612	52	560	338	55.2	60.4
612	62	550	406	66.3	73.8
612	77.2	535.4	373	60.0	69.8

Another test was made with four recording watt-hour meters on four different incubators in different parts of the plant. The kilowatt-hour consumption of each incubator per day and per hatch was determined from these meters. It was found that the temperature of the room affected the consumption of power materially. This is shown by the curves plotted on cost per hatch against cost per kilowatt-hour at different temperatures and is brought out in Fig. 3 and Table 1. The results of the test were as follows:

Number of incubators	131
Egg capacity (per machine)	612
Egg capacity (total)	80,172
Connected load, kw.	61.9
Connected load (per machine), watts	475
Maximum monthly kw.-hr.	14,160
Maximum monthly power bill	$354.90

The costs were:

Per hatch of chickens, power	$1.90 to $2.10
Per 100 chickens, power	0.50 to 0.58
Per hatch of chickens, power and labor	4.35
Per 100 chickens, labor and power	1.20

In the two columns of data in Table II giving the percentages of chickens that hatched one percentage is on the basis of the total egg count, while the other is on the basis of the fertile egg count. It is obvious that only a fair average of eggs hatched can be obtained by the hatchery because of the loss due to the unfertile eggs.

In Fig. 3 is shown the cost per hatch at different rates per kilowatt-hour and at different room temperatures. If the temperature of the incubator room is high, the amount of power used by the machines in operation is lowered. There are, however, three factors entering into the consideration of the proper maximum temperature for the room—first, the most satisfactory temperature for cooling the eggs; second, the temperature under which it is possible

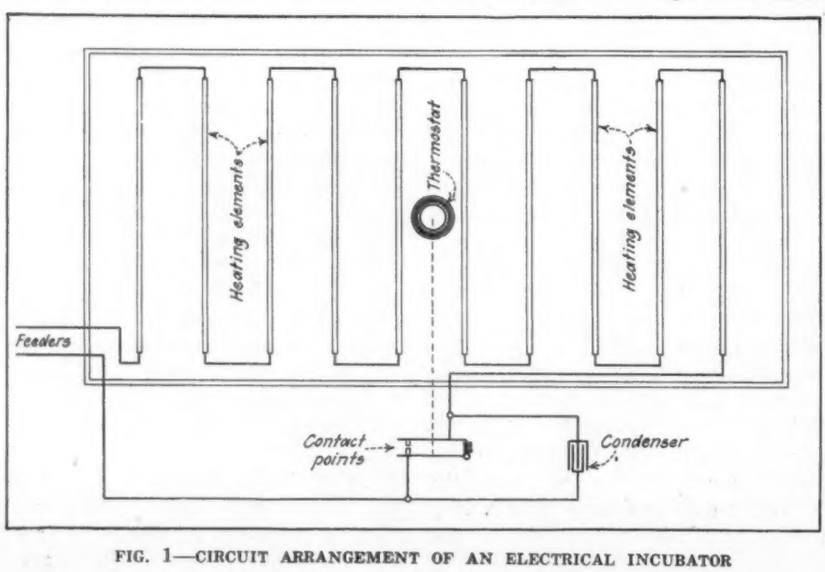


FIG. 1—CIRCUIT ARRANGEMENT OF AN ELECTRICAL INCUBATOR

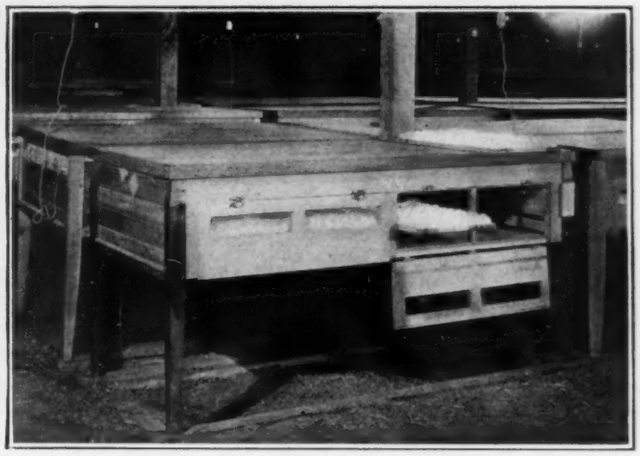


FIG. 4—612-EGG ELECTRICAL INCUBATOR

Each incubator is 35 in. x 75 in., built of cedar and lined with paraffined pasteboard. The doors are of double glass.

for men to work comfortably, and, third, the temperature adapting itself to most efficient ventilation.

Another feature of electrical incubation upon which experimental study could advantageously be undertaken is that of the most desirable capacity of the heating elements. Would it have been detrimental to incubation if the 475-watt machines under test had been equipped with heating elements of smaller capacity? Advantages of the smaller-capacity element from the electrical standpoint would be a decrease in maximum demand of the plant and an increase in the load factor, both of which would result in a lower rate per kilowatt-hour. In cases where all machines are in operation at the same time, as they are for a very short time when the eggs are being cooled or just after a ten-minute or fifteen-minute interruption to service, the maximum capacity of the heating elements is used for a very short period only. If the machines were using a smaller heating element, say 300 watts, the maximum demand would be 37 per cent less, and likewise all equipment could be 37 per cent smaller.

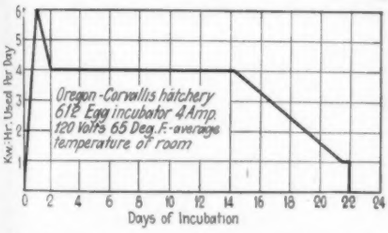


FIG. 2—KILOWATT-HOUR CONSUMPTION OF A SINGLE ELECTRICAL INCUBATOR DURING THE HATCHING OF THE EGGS

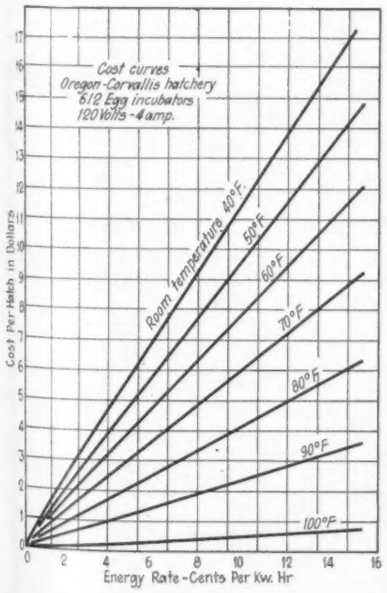


FIG. 3—TOTAL COST PER HATCH AT VARIOUS RATES PER KILOWATT-HOUR AND FOR DIFFERENT ROOM TEMPERATURES

The reliability of electrical incubation has been shown by the fact that during the two years of operation by the Oregon-Corvallis hatchery no thermostat or other electrical failures have occurred on the 131 electrical incubators.

Farmers' Associations Help Solve Power Shortage

DURING the unprecedented drought in southern California, which has resulted not only in a shortage of power but also in an increased demand by farmers for additional energy for irrigation pumping, every effort is being made to economize in the use of power. Following the 25 per cent curtailment order issued by the Southern California Edison Company, the California Fruit Growers' Exchange and the California Walnut Growers' Association, in a newspaper advertisement, urged upon the public the necessity of conserving energy so that farmers could have sufficient power for irrigation to save their crops. In the advertisement the following methods of cutting down their use of energy were suggested to residential and commercial customers in Los Angeles:

WAYS YOU CAN SAVE ELECTRICITY IN YOUR HOME

1. Remove all bulbs from lighting fixtures not absoluted needed.
2. Use smaller bulbs wherever possible.
3. Unscrew unnecessary bulbs in chandeliers and group lights.
4. Turn off lights when not needed (listen to your radio in the dark).
5. Arrange so two or more persons can read from same lamp.
6. Use porch, hall, garage and basement lights only when immediately required.
7. Put away your electric irons, toasters, percolaters, waffle irons, etc. —use kitchen range.
8. Enlist the aid of servants and all members of your family to save electricity.

PRACTICE THESE SAVINGS IN YOUR BUSINESS

1. Discontinue all local sign and display lighting.
2. Discontinue all floodlighting.
3. Use only half the usual lighting in show windows.
4. Reduce interior lighting by removing at least one-fourth the lamps.

Silver Trophy Stimulates District Sales Effort

AS A STIMULUS to competitive sales effort among employees of the Pacific Power & Light Company, Portland, Ore., during merchandising campaigns, Guy W. Talbot, president of the company, has offered a silver cup to that district organization reaching the highest percentage of quota in any major campaign carried on throughout the territory served by the company.

Major campaigns are understood to mean range, washing - machine, vacuum-cleaner or other large appliance campaigns conducted by the appliance sales department.

The trophy, which is known as the "president's cup," is engraved on one side with the following inscription: "Pacific Power & Light Company—Presented by Guy W. Talbot, President, for Excellence in Sales." Space is provided on the cup for engraving the name of each winning district with the title of the campaign and the date. It will become the permanent property of the first of the seventeen districts of the company that is successful in winning it in three campaigns, and in the meantime it remains on display in the office of the last winning district until it is again placed in competition.

The trophy is keenly desired by the employees of the various district organizations, and in each office in which it has been displayed it has invariably created favorable comment by customers. Since it was first offered in the fall of 1923 it has been in competition three times, and it now carries the following inscription: "Won by—Walla Walla, Thor Washers, 1923; Pasco-Kennewick, Premier Cleaners, 1924; Hood River, Electric Ranges, 1924."

Puget Sound Company Sells 803 Electric Ranges

BY MEANS of a forty-five-day campaign conducted this summer by the Puget Sound Power & Light Company, Seattle, 803 electric ranges were sold and installed. This campaign, which was carried on in all the towns served by that company west of the Cascade Mountains and north of Olympia, Wash., under the direction of H. J. Gille, general sales manager, was the first of its kind undertaken by the company and was successful beyond expectations. R. W. Clark, sales manager of the Seattle division, who, with L. R. Grant, assistant sales manager, organized the working details, attributes the success attained to the co-operation received from the employees in all departments of the company.

Before the campaign commenced a letter was directed to the employees in Seattle and the other cities and towns in which sales effort was to be applied seeking their aid in furnishing names of "prospects" and making sales and outlining the basis of extra compensation to be received for such effort, which was 5 per cent for every range sold and 3 per cent for every name turned in which led to a sale by a regular salesman. This letter was followed by educational meetings in each division. The meeting in Seattle was attended by more than two hundred employees. During the campaign other employee meetings were held and other communications were sent out, so that interest was sustained throughout, and the net result was that many of the sales were made by employees not in the sales department and to persons whose names were turned in by such employees.

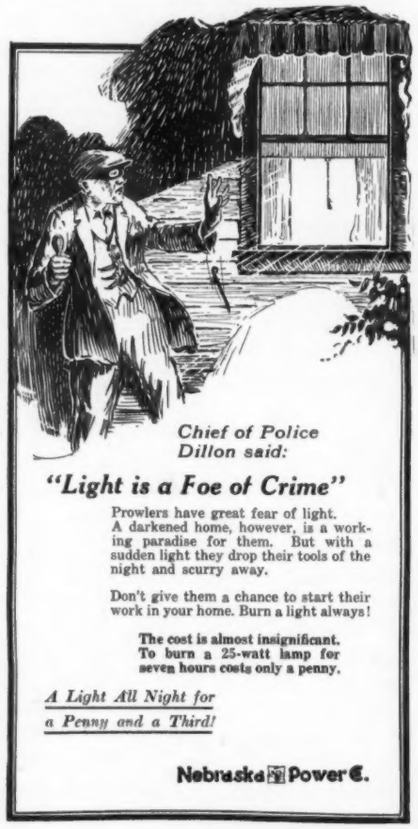
In all divisions quotas were established so that the spirit of competition might be injected into the campaign. Prizes were offered for all divisions reaching their quota, and for the divisions making the highest percentage of quota. Individual salesmen also received quotas based on the territory allotted to them, and prizes were offered in this department for highest sales.

Individual sales effort was supplemented by newspaper advertising and by banners on company automobiles proclaiming the terms of purchase, which were a moderate payment down of $10 with the balance on easy terms. Cooking schools and demonstrations, conducted by experts from the Edison Electric Appliance Company in the main cities of all divisions, proved to be popular with the public, and many sales were traced to this activity.

H. J. Gille, in commenting on the results obtained, said that apparently there is a strong desire among a great many women to cook electrically and that the principal point to be stressed is that the operating cost is not excessive.

Advertising to Stimulate Porch Lighting

TO ENCOURAGE the use of more light in the home the new-business department of the Nebraska Power Company, Omaha, recently used a series of advertisements, some of which are shown here, to present the advantages of porch lighting. The copy was written to point out the fact that a well-lighted home is very good burglar insurance. Each advertisement tied in this feature with the low cost of operation, explaining that for a little more than one cent a 25-watt lamp could be burned throughout the entire night. The slogan "A light all night for a penny and a third" was used in all of the advertisements.



Chief of Police Dillon said:

"Light is a Foe of Crime"

Prowlers have great fear of light. A darkened home, however, is a working paradise for them. But with a sudden light they drop their tools of the night and scurry away.

Don't give them a chance to start their work in your home. Burn a light always!

The cost is almost insignificant. To burn a 25-watt lamp for seven hours costs only a penny.

A Light All Night for a Penny and a Third!

Nebraska Power Co.

This is the House!

NO stumbling up dark steps; no lighting of matches to find the number; no fumbling for the door bell AT THIS HOUSE.

The host was thoughtful and considerate. The porch light was burning, sending forth a genuine welcome.

The guests found the house without trouble, for the address stood boldly out, thanks to the light radiated by the porch light.

The cost of this thoughtfulness and consideration is but little. To burn a 25-Watt lamp on your porch for seven hours costs only a penny.

A Light All Night for a Penny and a Third!

Nebraska Power Co.

CONVENIENCE AND PROTECTION OF PORCH LIGHTING

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Photostat copies or English translations of complete articles will be furnished at cost upon request

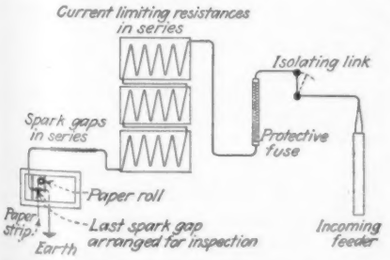
Hydro-Electric Development and Steam Equipment

High-Speed Turbo-Generator. — The advantages of high-speed steam-turbo-generator sets are not so much along the line of heat economy as in the more pronounced savings of material. For three 20,000-kva. units with speeds respectively of 1,000, 1,500 and 3,000 r.p.m. the relative values for the complete weight of set are 19, 14 and 10 and the relative values for the complete cost of set are 16, 12.5 and 10. A 3,000-r.p.m. set for 16,000-kw. continuous output and 24,000-kw. limit output has recently been installed in a municipal plant. At 13½ atmospheres steam pressure and superheated steam of 350 deg. C., the unit requires, including excitation and condensation 4.85 kg. of steam per kilowatt-hour at full load, 4.99 kg. at three-quarters load and 5.2 kg. per kilowatt-hour at half load. — *Electrotechnische Zeitschrift*, July 3, 1924.

Practical Coal Carbonization.—A. R. POWELL.—When any process attempts to make low-temperature "semi-coke" from coking coals certain, special problems present themselves which are not encountered when the raw material is limited to poorly coking or non-coking coal. These special problems resulting from the use of coking coal are fully described by the author, followed by a discussion of general problems incident to all low-temperature coking processes. — *Mechanical Engineering*, July, 1924.

Generation, Control, Switching and Protection

Voltage Surges and Protection of Alternating-Current Circuits.—G. W. PARTRIDGE.—The author describes a system of prevention and also protection from rises in voltage on an alternating-current system. The apparatus as shown in the accompanying illustration consists of a number of spark gaps between small metal cylinders (known as the "Wurtz arrester") connected in series with a set of current-limiting resistors. These resistors are of the carbon-powder type and are wired non-inductively and connected directly to the insulated high-pressure end of the feeders through an isolating switch and protective fuse. The other end of the set of resistors is connected to the spark gaps, the last gap being connected to earth in a convenient position for inspection. A strip of thin paper from a small roll is passed between the last two gaps. In operating, this paper is punctured by the current and the puncture can readily be seen by means of a light installed behind the paper.—*Electrical Review (England)*, June 20, 924.



ARRANGEMENT OF SURGE PROTECTION APPARATUS SET TO OPERATE AT 14,000 VOLTS

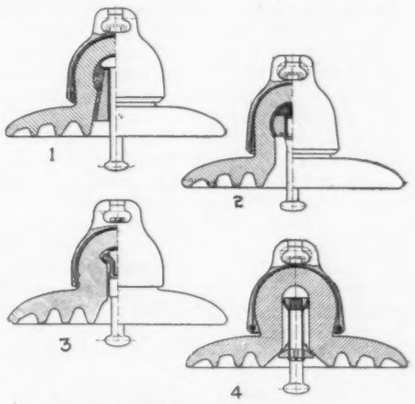
Eddy Losses in Windings of Alternating-Current Machines.—J. WENNERBERG.—This paper gives an approximate method for the determination of eddy losses caused by leakage fields in the slots of alternating-current machines. The method is one of successive approximations as first suggested by H. W. Taylor (*Journal of Institution of Electrical Engineers*, 1920, page 279). The current in a conductor is first considered as uniformly distributed across the cross-section. The induction, which is assumed to vary as a straight line acorss the slot, can then be computed for different points, as well as the total flux which surrounds each part of the conductor. Then the induced voltages and the corresponding currents are determined for each part of the conductor. This current lags an angle of 90 deg. behind the main current, and the corresponding losses, computed separately, represent the extra losses of the first approximation. The new current distribution can be made a basis for a second calculation of similar nature, giving extra losses of the second approximation, and so on. Experience has shown, however, that the first approximation is sufficiently close as long as the extra losses do not exceed 30 per cent to 35 per cent. The investigation is carried out for solid and divided conductors.—*Teknisk Tidskrift Elektroteknik*, (Sweden), June 7 and July 5, 1924.

Protection of Steam-Turbine Disk Wheels from Axial Vibration. — W. CAMPBELL.—The first of this series of three articles, appearing in the previous issue, outlined the troubles which gave rise to the investigation and reviewed the preliminaries which led to the discovery of the cause of the vibration in turbine disks. The second part, given in this issue, gives a general discussion of the nature and theory of vibration of the turbine wheels and explains why it is necessary to rely on actual tests in addition to purely analytical methods in order to accomplish thorough protection of the factory product. The last part will describe the methods of testing and give the procedure which has resulted in the elimination of vibration difficulties from recently built turbines.—*General Electric Review*, July, 1924.

Transmission, Substations and Distribution

High-Tension Cable.—M. C. TIMMS.—The author gives a description of the laying and jointing of 50 miles of 22,000-volt cable in the Melbourne district of Australia. In order to protect the lead covering, the cables are installed in one of the three following ways: (a) pipes or conduits, (b) lead-covered cable laid in specially prepared troughs, which are afterward filled with bituminous composition, and (c) armored cables laid directly in the ground.—*Electrical Engineer of Australia and New Zealand*, May, 1924.

Recent Development of High-Tension Insulators.—M. BUCOV.—The recent development of high-tension suspension insulators has proceeded along the following lines: (1) Types retaining the present hood shape with (a) improvement of the shape and cementing material or (b) the developing of insulators in which the clapper and the hood are not cemented; (2) developing of a shape which varies in every respect from the hood-type insulators, and (3) the development of the so-called puncture-proof insulators. The new insulators which have been developed out of the hood type are based on the ball-shape type for the employment of porcelain pieces inside the insulator whereby the clapper is fitted only half rigidly and unhindered expansion is insured. The trend of insulator design is pointed out, with a complete description of the more important work that has been done.—*A. E. G. Mitteilungen*, May, 1924.



TREND OF INSULATOR DESIGN

Movable Cross-Arms for Line Towers.—W. CRAMER.—If a wire breaks on a transmission line, the supporting arms on the two adjacent towers are subjected to a very considerable side twist, which may cause bending or even breaking. A design of a cross-arm has been perfected and placed in actual service which is not rigidly fastened to the tower but is held to it with hinges, permitting side motion and up-and-down movement. Any unbalance of cable pull will thus be greatly lessened by allowing the affected cross-arms to swing out in the direction of increased pull. This construction is also useful for diminishing the dangers from excess weight on the wires due to sleet formation.—*Elektrotechnische Zeitschrift*, July 3, 1924.

Units, Measurements and Instruments

A Small Peak Voltmeter and Its Application.—A. C. BARTLETT.—A very compact peak voltmeter, using a thermiomic rectifier for measuring positive and negative peak values up to 600 volts, is described. The capacity of the instrument is only a few micro-microfarads, and thus it can be used in radio-frequency circuits for determination of "oscillation lines" and similar quantities often encountered.—*Journal of Scientific Instruments* (*England*), June, 1924.

Insulation Tests of Transformers as Influenced by Time and Frequency.—F. J. VOGEL.—Many transformers are now being designed for service with one end of the high-voltage winding solidly grounded. These transformers require an overpotential test by induced voltage of either 2.73 or 3.46 times their normal line voltage above ground plus 1,000 volts. These tests must be made at more than normal frequency, to avoid too high a flux density in the core and also to reduce the power required for excitation. It has long been known that the breakdown voltage of solid materials used was affected by the length of time of application of voltage. Likewise the frequency of the applied voltage is shown to affect the breakdown voltage for solid insulations, increase in the frequency resulting in a decreased breakdown voltage. The voltage required for creepage failure is shown to be relatively unaffected by frequency. From the results of the tests made it is concluded that induced voltage tests on transformers with graded insulation at higher than normal frequencies should not have the test voltage reduced, but should have the duration of the test shortened to make the severity of the test comparable to the test at 60 cycles on normally insulated transformers.—*Journal of A. I. E. E.*, July, 1924.

Illumination

Use of Light for Outdoor Advertisements.—G. P. GARBETT.—The author discusses typical still and flasher signs being used in England, America and Europe. He makes an interesting point with regard to the actual value of signs. It is his opinion that there is a vast field for enterprise in electric sign designing and selling, but that this business will not develop nationally unless the contractor realizes that the electric sign is not merely for electrical merchandise, but that it is primarily a form of advertising. Reference is also made to the great variety and complexity of regulation for outdoor signs in use in cities. These regulations should be standardized.—*Illuminating Engineer* (England), Vol. XVII, No. 4.

Heat Application and Material Handling

Boosting Flame Temperatures with the Electric Arc.—G. T. SOUTHGATE.—An account of a newly developed method of increasing the heat available from fuel combustion by electricity is given. The main purpose of this heating is the joint use of combustion energy and electricity in various usual types of furnaces in such a manner that fuel, the cheaper agent, supplies the greater part—from 80 per cent to 90 per cent—of the total heating and the electric arc supplies the remaining portion for raising the temperature above that obtainable by pressure alone. The author applies this process in typical operations of melting and smelting. A description of a furnace employed is given with examples of its work.—*Chemical and Metallurgical Engineering*, July 7, 1924.

Experience with Electric Cooker.—E. G. ROSS.—Some very interesting and valuable figures and facts regarding the use of electric cookers for domestic purposes are given. For the period of two months the author kept very strict account of the manner in which electric cooking was conducted on a specific range and then compared the results obtained with those obtained with gas cooking. The information given should be found useful, particularly to salesmen.—*Electrical Review* (England), July 4, 1924.

Welding Equipment in a Railroad Shop.—J. S. HEATON.—Welding is one of the most important processes in the modern railroad shop. To perform welding successfully the equipment should be of modern design for all requirements. The author considers the selection of equipment, the best methods of adapting them for shop operating conditions, uses of acetylene equipment, electric arc welding, etc.—*Railway Mechanical Engineer*, July, 1924.

Butt-Welding Mills.—One of the first steps taken by the Youngstown Sheet & Tube Company upon its acquisition of the properties of the Steel & Tube Company of America was to inaugurate a program for the enlargement of the plant at Indiana Harbor, Ind. Two butt-welding mills have just been completed and will roll pipe from ⅛ in. diameter up to 3 in. Each mill will produce approximately 400 tons daily. Details of the mills are given.—*Iron Age*, July 3, 1924.

Electrophysics, Electrochemistry and Batteries

Liquefaction and Rectification of Air.—I. D. GOLDSMITH.—The author gives a short résumé of the history of the subject and then explains the principles on which the working of typical air liquefaction and separation plants depends.—*World Power* (England), July, 1924.

Studies of Electric Discharges in Gases at Low Pressures.—I. LANGMUIR and H. MOTT-SMITH, JR.—The relative simplicity of the phenomena in the high vacuum of electron tubes is one of the reasons why these tubes have found such a large use. The authors are now engaged in a study of the much more complicated phenomena of gaseous discharges, such as those encountered in the mercury-arc rectifier. By new methods of using collecting electrodes quantitative measurements of many of the fundamental factors of gaseous discharges have been made possible. The theory of the plane, cylindrical and spherical collectors, with retarding and accelerating fields, is presented in this article, the first of a series on this subject. Subsequent articles will deal with typical experimental data with plane, cylindrical and spherical collectors, followed by a general discussion of these results and their interpretation.—*General Electric Review*, July, 1924.

Traction

Electrification of Railways.—S. PARKER SMITH.—Continuing his articles on the electrification of railways, the author in these two issues deals with roads electrified in America. With the exception of the Virginian Railroad, all of the lines considered were electrified previous to the war. At the end of 1920 there were eighteen electrifications of a main-line character. Not only have the American railways and manufacturers been pioneers in low-tension, direct-current and single-phase traction, but they have also evolved the high-voltage, direct-current system. The electrified mileage is much greater than in any other country, and the Chicago, Milwaukee & St. Paul Railway has the longest electrified section in the world.—*World Power* (England), June and July, 1924.

Telegraphy, Telephony, Radio and Signals

Current Supply for Telephone Exchanges.—K. SCHMIDT.—For supplying low-voltage direct current for feeding transmitters and signal lamps in telephone exchanges it is customary to provide 24-volt to 60-volt storage batteries in two sets, which are charged and discharged alternately. The current of ordinary direct-current dynamos cannot be used for this purpose on account of the unavoidable noise of the commutators in the receivers. Even with specially built direct-current generators and a battery floating on the line, no absolute silence can be obtained. The author has developed a system wherein machine current of such uniform character is derived that it can be used in the same manner as the previous battery current. A system of this type is in use in Saxony. A Standard direct-current dynamo is employed, the current of which is sent through a special three-winding transformer with an auxiliary battery current superimposed. The winding data for this transformer are given. To avoid the battery the author suggests using a gasoline-driven emergency generator and a flywheel set for the motor-generator. If the power supply for the latter should fail, the energy stored in the flywheel set will keep it running for a sufficient time to start the emergency power set.—*Elektrotechnische Zeitschrift*, July 3, 1924.

Miscellaneous

Fire-Extinguishing Liquid.—Specifications are given for fire extinguishers using a liquid with carbon-tetrachloride base. The specifications cover the type, material and workmanship, general requirements, appearance, specific gravity, cold test, distillation, impurities, etc.—*Circular of the Bureau of Standards No.* 134.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

At the British Association

Long-Distance Direct-Current Transmission Foreseen—Chemists Talk of Future Fuels

THE 1924 meeting of the British Association for the Advancement of Science was held in Toronto August 6 to 13 with hundreds of the world's foremost scientists in attendance. Apart from the organization meetings, more than three hundred papers were read and many meetings were carried on simultaneously by the thirteen sections.

The meetings of the Engineering Section opened with an address by the president of the section, Prof. G. W. O. Howe, who reviewed the century of progress in electrical engineering. He said that long-distance transmission of electrical power might yet take place by direct currents of high voltage, instead of by the alternating-current system. He also championed the unidirectional system as opposed to the alternating-current method. The constant-current principle had again been brought to the fore by the demonstration on a commercial scale at the British Empire Exhibition of machinery for efficiently producing direct currents of sufficiently high voltage to permit their application to long land lines without undue waste, Doctor Howe reported. Dealing with the question of electrification of railways, he said the time was ripe for a continent-wide agreement for the purpose of standardizing equipment.

The Ontario Hydro-Electric Power Commission's system and its development was the subject of a paper by F. A. Gaby, engineer of the commission, who said that, although an electric power shortage was in prospect, the future of the "Hydro" was full of promise.

Substitutes for Coal

In offering to electrochemists the task of forming a substitute, Prof. F. G. Donnan of University College, London, declared the time would come when coal or other forms of carbon would not supply the demands of the world for fuel. Fuel derived from salt deposits by the aid of electric power was the suggestion he presented. By his scheme electric power would not be used directly for heating purposes, but would be utilized in generating stations erected near to deposits of sodium chloride. The metallic sodium and the chlorine gas would be shipped and burned where the heat was required.

L. F. Goodwin of Queen's University drew attention to the fact that millions of horsepower of water-generated electricity was going to waste on this continent because of difficulties involved in transmission. Some method for electrolyzing cheap chemicals so that energy could be shipped by rail in solid form would avoid much of this loss, he said.

That solution of the ice problem forms the crux of the situation in connection with the St. Lawrence development for navigation and power was the opinion of R. S. Lea of Montreal, consulting engineer, who laid in detail before the engineers the plans which have been formulated to date.

Professor Horace Lamb, F.R.S., of Trinity College, Cambridge, was chosen president of the association for 1925, and it was decided to hold the next meeting at Southampton, England.

Politics and Water Power

Democratic Candidates for Presidency and Vice-Presidency Declare Against Monopoly

PRESIDENT COOLIDGE in accepting the Republican nomination last week made no reference whatever to water-power development unless his declaration, "I favor the American system of individual enterprise, and I am opposed to any general extension of government ownership and control," be regarded as having an inclusive slant in that direction.

Earlier in the week his Democratic opponent, John W. Davis, in his acceptance speech said: "We shall conserve all the natural resources of the country and prevent the hand of monopoly from closing on them and on our water powers, so that our children after us shall find this still a fair land to dwell within."

The Democratic candidate for Vice-president, Charles W. Bryan, speaking at Lincoln, Neb., on Monday last, expressed his views at greater length, but, like Mr. Davis, made no direct allusion to the existing water-power act or the Federal Power Commission. He said:

"The Democratic platform favors the development of our water power. If the water power of Muscle Shoals and in the mountain streams and in the rivers throughout the land were developed it would supply the power to operate all of our factories, all of our industries and all of our means of transportation.

"It would enable the raw materials of the country to be manufactured where they are produced, thus saving the cost of transportation of the raw product to the factory and the finished product back to the consumer. It would enable industries to spring up where needed most to create business and to supply human needs.

"If the water power of the nation were developed it would furnish electric current to light and heat the homes of the cities and on the farms, and supply electric power to operate all the machinery necessary for the needs of the farms and for the convenience and comfort of the homes, both city and rural, at a small fraction of the present cost.

"The Democratic platform favors the strict public control of and conservation of all the nation's natural resources, including coal, iron, oil and timber. The Democratic Party believes that the nation should retain title to its water-power sites and favors the expeditious creation and development of our water power for the use of our citizens.

"If the water-power sites of the country were allowed to pass into the hands of great combinations of capital, the people would pass under a yoke of servitude more galling, if possible, than any foreign landlord system."

General Charles G. Dawes, Republican vice-presidential candidate, in accepting the nomination at Chicago on Tuesday, made no reference to water power.

Third Niagara Unit Ready

Power Company's 210,000-Hp. Installation Completed Four Months Ahead of Contract Time

SEPTEMBER 1 has been set as the date for placing in operation in the plant of the Niagara Falls Power Company the third of its new 70,000-hp. turbo-generators, thus completing the eleven-million-dollar development, work on which has been under way for the last three years. It is only about nine months since the first of these three units, the largest of their kind in the world, went into service. These units are housed in Station 3-C, at the foot of the 200-ft. cliff on the shore of the lower Niagara River.

"Aside from this 210,000 maximum horsepower capacity," said John L. Harper, vice-president and chief engineer of the Niagara Falls Power Company, "the Niagara Falls Power Company's hydraulic plant has three generating units in its Station 3-B, built as an extension a few years ago, each of 37,500 maximum capacity, or 112,500 hp. combined, and has in the original station thirteen units, each of 10,000 hp. capacity, or 130,000 hp. combined. Our Canadian Niagara power house on the Canadian side of the falls has 100,000 hp. capacity. Our Niagara plant in Buffalo Avenue, the old original Niagara Falls Power Company plant, also has 100,000 hp. capacity. It will be held as a reserve power house

for emergency or relief use when we get Station 3-C in full operation."

The company thus has available a maximum output of 552,500 hp., aside from that of the standby plant.

The entire development work has taken four months less to complete than was originally estimated, the contracts not requiring it to be completed before January 1, 1925.

Sir Adam Beck Non-Committal on St. Lawrence

Upon his return from the British Isles, where he spent several months attending conferences on hydro-electric matters, Sir Adam Beck, chairman of the Ontario Hydro-Electric Commission, said that an industrial renaissance was shortly to be experienced in Canada and would be brought about by increased production of electrical power. He added:

"We do not yet realize the value of electricity or we would not be wasting millions of tons of coal annually when we are in a position to produce all the electrical power necessary to the successful and economic operation of all our industries. There is no need to go to the United States for power when we have in Canada the greatest opportunities in the world for water-power development. In Quebec as well as in Ontario there is every need for greater power development. We must double or triple our production of 'white coal' if we are to develop our industries without placing ourselves under an obligation to the United States."

The scheme for the deepening of the St. Lawrence waterways came in for some comment from Sir Adam, but he would not state whether he was in favor of it or not. The political and economic future of the country was wrapped up in the scheme, he said, and extreme care would have to be exercised in order that Canada might not be rushed into an enterprise which might later prove to be Utopian.

In a statement given out in London, Ontario, Sir Adam contended that Nova Scotia coal would make Canada independent of the United States in respect of the proposed establishment of three or four large steam plants for generating electricity in Ontario. "We can get large quantities of soft coal from Nova Scotia for use in the auxiliary steam plants of the province," Sir Adam said. He also drew attention to the fact that the Provincial Legislature had authorized the expenditure of large amounts on auxiliary plants which would shortly be established at strategic points throughout Ontario. These large units would help to augment the electric power developed at Niagara Falls, he said.

Sir Adam denied reports that there had been any definite arrangements regarding his association as director with any large electric interests in Great Britain. There had been persistent rumors in Canada for some time that Sir Adam would take charge of the work of establishing a gigantic electric development and distribution system in the British Isles on behalf of the government.

Martin J. Insull Buys Page Interests in Tulsa

Martin J. Insull, president Middle West Utilities Company, has closed negotiations with Charles Page of Sand Springs, Okla., whereby Mr. Insull becomes the owner of the light and power distributing service of the Sand Springs Power, Light & Water Company. The consideration is not announced. The deal involves merely the distribution of light and power in Tulsa and West Tulsa, in which the Sand Springs company has been a competitor of the Public Service Company of Oklahoma, a subsidiary of the Middle West Utilities. It does not affect electric service given to communities other than Tulsa. It is probable that the business will ultimately be consolidated with that of the Public Service Company of Oklahoma, whose general offices are in Tulsa and of which Fred W. Insull is president. The City Commissioners of Tulsa have passed an ordinance accepting the surrender of the franchise formerly owned by the Sand Springs Power, Light & Water Company and authorizing the merger of the Tulsa properties of that company with the Public Service Company of Oklahoma if that method of handling the properties is the plan ultimately decided upon by the new owner.

Aberdeen (Wash.) Municipal Plant Enjoined

A permanent injunction has been granted by a Washington State court which is expected to block effectively the proposed municipal power project of the city of Aberdeen at a nearby site on the Wynooche River. Conflicting applications covering this project are before the Federal Power Commission. In addition to the city of Aberdeen the Grays Harbor Light & Power Company, a Sanderson & Porter interest, has asked for a preliminary permit.

The effort of the municipal authorities in Aberdeen to develop the power project has been the cause of a bitter local controversy, property owners claiming that the resolution for a bond issue of $2,000,000 was rushed through the City Council and adopted by a scant majority of the voters without a knowledge of the facts.

New Questions Before Power Commission

Where Is Line of Demarcation Between Major and Minor Licenses? —Can Commission Refuse to Give Recognition to Interior Department Patent?

BECAUSE of a question raised in connection with the Electra plant of the Pacific Gas & Electric Company on the Mokelumne River in California, the Federal Power Commission must render a decision as to the exact percentage of public lands in the project area, which is to determine whether or not a major license must be issued.

The Electra plant has been in operation fourteen years. The company contends that the public lands involved were put to this use before legislation was passed requiring federal rights. It is willing, however, to be put under that type of license which covers a minor part of a project that does not require special accounting to the federal government. The company is of the opinion that were the case taken to court a decision would be forthcoming which would free it from taking out any license, but to avoid litigation it is willing to operate under a minor license.

In cases previously passed upon the commission has made no effort to determine the exact line of demarcation between major and minor licenses, but the inclination apparently has been to regard a major license as necessary when public lands exceed 15 per cent of the project area.

The structures of the Electra project occupy approximately equal portions of public and private lands, but if the reservoirs are considered the proportion of public lands is reduced to 10 per cent. In this particular instance the public interest is not affected since the plant for many years has been under the jurisdiction of the state, but the commission's decision will have a bearing on future applications.

The Southern Sierras Power Company has filed an amended application for a license covering the project in Owens River Gorge for which the city of Los Angeles is also claiming rights. The lands involved in this power site have been the subject of legislative action. In 1906 Congress authorized the sale to Los Angeles of certain of these lands in connection with its aqueduct project. On this authority the city bought up large areas in the river valley. Some contend that these purchases exceeded any area contemplated by the act of Congress. The General Land Office at one time questioned the validity of the transaction, but the Secretary of the Interior confirmed the sale of these lands to the city. A patent finally was issued in 1913, but it contained certain reservations as to the outstanding water rights.

An act approved June 5, 1920, extended the scope of the original grant, but contained a number of conditions which invite controversy. The Southern Sierras company contends that these reservations and conditions were inserted in the law to protect its established rights and those of its predecessors in this section of the Owens River. On this assumption the Southern Sierras company applied for the license, which is in direct conflict with the Los Angeles program. The point now has been reached where the Federal Power Commission must make a decision in the matter. While final action has not been taken, it is understood that the study indicates that it is not within the jurisdiction of the commission to question the validity of the patent granted by the Interior Department.

Progress in Lighting Reported at Geneva

International Commission on Illumination Hears Reports and Papers and Adopts Definitions and Symbols—Lieb Tells of Central-Station Ideals

THE sixth session of the International Commission on Illumination, held at Geneva, Switzerland, July 22-25, and briefly reported in last week's ELECTRICAL WORLD, was a notable one not only because of the large and influential representation from the various member countries but also because it marked the active entrance of the commission into the field of practical problems of illumination. The session was attended by delegates from the national committees in the United States, Great Britain, France, Italy and Switzerland and by a representative from Japan, where the organization of a national committee has not yet been completed. The United States delegation was headed by Dr. Clayton H. Sharp, president of the national committee, the other delegates being John W. Lieb, E. C. Crittenden, C. O. Mailloux, G. S. Merrill and A. L. Powell. America also had the honor of the presidency of the session, Dr. Edward P. Hyde having been elected to this office at the preceding session in 1921.

The Illumination Commission differs from many international technical organizations in that it not only considers definite proposals for international agreement on standards of various kinds, but also includes in its proceedings technical papers summarizing work on current problems. The 1924 session included five technical meetings, besides the plenary meetings at which the formal business of the commission was transacted.

PHOTOMETRY AND NOMENCLATURE

In all the sessions American contributions played a significant part, and several of the papers presented were brief summaries of work which has already been published in greater detail in this country. A notable example was the report by Dr. H. E. Ives on his investigation of a platinum-cylinder "black body" presented at the initial technical meeting under the title "A Primary Standard of Light Following the Proposal of Waidner and Burgess." Other papers and discussions brought out the fact that in at least three other countries investigations are under way looking toward the possibility of using a "black body," or complete radiator, as a standard of light, but all of these are as yet in preliminary stages. Dr. Ives is therefore the first to carry through the work to the stage of producing definite results. His paper was received with sincere appreciation by all the foreign delegations, but it was felt that until more corroborative experimental results were obtained the commission should not commit itself to the acceptance of his particular apparatus or his exact numerical results.

It was agreed, however, that the only procedure which gives promise of producing a really satisfactory primary standard of light is the use of the complete radiator, whose physical properties are very well known, rather than the development of any special lamps depending on dimensions or the properties of particular materials. The American committee proposed the resolution printed last week (page 330) recommending the use of a black body at the melting point of platinum, but most of the delegates thought it better to make the recommendation more general for the present, and not to attempt to specify any of the conditions of operation, and a resolution was passed recommending that the National Laboratories take steps (1) to formulate standard specifications for the construction and the conditions of operation of the black body as a primary standard of light; (2) to fix upon a definite figure for the brightness of the black body operated under these conditions, expressed in international candles per square centimeter.

At the first technical meeting there was also presented a paper by W. E. Forsythe and A. G. Worthing on "The Properties of Tungsten and the Characteristics of Tungsten Lamps," which probably constitutes the most complete summary of the properties of any material ever published. This will be of great usefulness to those working on lamps, electron tubes or other apparatus in which tungsten is used, but the nature of the paper makes it useless to attempt to reproduce it in condensed form.

The meeting which dealt with definitions, symbols and vocabularies had as a basis a report by a special technical committee appointed by the commission in 1921 as well as reports submitted by the national committees of France, Great Britain, Italy and the United States. At the 1921 session definitions were adopted for luminous flux, luminous intensity, illumination, and the corresponding units, the lumen, the international candle, the lux, phot and foot-candle. The correspondence which has taken place between the various national committees since then made it possible now to agree upon definitions of transmission factor, absorption factor, reflection factor, total flux, upper hemispherical flux, lower hemispherical flux, mean spherical intensity, mean upper hemispherical intensity, mean lower hemispherical intensity, mean horizontal intensity, reduction factor, efficiency of a source, visibility factor and brightness—fourteen definitions in all. A table of symbols was also adopted.

HETEROCHROMATIC PHOTOMETRY

The meeting dealing with heterochromatic photometry received reports from a special committee summarizing progress during the last three years, from the British National Physical Laboratory, the Laboratoire Central d'Electricité of Paris and the Bureau of Standards. The British work has been largely in the determination of the relation between the temperature of tungsten filaments and their "color temperature," or distribution of energy in the visible spectrum as judged by matching them in color with a black body. The French report dealt with the use of colored screens to reduce color differences, following the general idea of the Crova method. This method did not receive much support in the discussion, but the usefulness of color-equalizing screens and solutions in practical photometry was recognized, and a formal resolution was adopted asking the special committee on heterochromatic photometry to include in its work the study of the properties of absorbent screens.

The paper by K. S. Gibson on "The Relative Visibility Function" summarized the results of work done at the Bureau of Standards and published in detail in the bureau's Scientific Paper No. 475. The observations reported were made by the equality-of-brightness method, using a step-by-step procedure to avoid large color differences in the actual measurements. Fifty-two individuals were included in the observations, and the results obtained were in very good agreement with the general average of previous determinations, which have differed more or less among themselves both in methods and in results.

ILLUMINATION PRACTICE

Turning to the question of the actual use of light, the commission heard three notable papers presenting the situation in America with particular reference to the activities of organizations commercially interested in furthering its more efficient and effective use.

John W. Lieb set forth most clearly and forcibly the point of view of the modern operator of central stations who feels that his responsibilities to his consumers do not end at the electricity or gas meter. In promoting good lighting on the premises of their customers, central-station men believe, he said, that the results will be of direct benefit to the public they serve and also that substantial benefits will accrue to the operating companies in the shape of increased revenues and a satisfied clientele. The problem is to find ways whereby the general public can be led to appreciate the possibilities of modern lighting and to make the necessary investment in adequate and effective equipment. Mr. Lieb raised the question whether the international commission, in addition to its scientific and standardizing activities, should not take the lead in spreading through its national committees the gospel of better lighting practice.

Mr. Lieb's paper was well seconded by those of G. S. Merrill on "The Demonstration Method of Teaching Good Lighting Practice" and A. L. Powell on "Practical Illuminating Engineering." It was resolved that at the next session of the commission an entire meeting should be devoted to papers and discussions on the art of illumination and its furtherance.

Another group of papers dealt with street-lighting problems and practice abroad and raised the question whether the commission might not adopt some general principles, such as a basic classification of streets and highways,

and the specification of minimum allowable intensities of illumination. It was considered, however, that this problem was altogether too complex to admit of any specific recommendations being adopted at this time.

The most vigorous discussion was aroused by the final technical meeting, that dealing with legal regulation of lighting. With regard to lighting of factories and schools, L. B. Marks, as chairman of the commission's special committee, presented a report based largely on the American codes which have been developed under his leadership by committees of the Illuminating Engineering Society and have been used by a number of states. Reports were also presented on current progress in Great Britain and in France. The French report included a very detailed classification of industries with suggested minimum illumination intensities for each. These suggestions, however, did not differ widely from the minimum values of the American codes, which were summarized in brief form in Mr. Marks' report. The commission therefore adopted a resolution recommending the latter report as a basis for rules, regulations or recommendations on the lighting of factories and school buildings. It was also resolved "that steps be taken for the purpose of calling the attention of the various countries, by means of circular letters, to the need of the adoption of rules, regulations and recommendations relating to the hygienic and safe lighting of factories and school buildings."

Automobile lighting was discussed in a report from a special standing committee, of which Dr. C. H. Sharp is the chairman, and by the French national committee. It was indicated that an international conference to consider problems of automobile traffic, including headlight requirements, might be called together by the French government.

Next Meeting in America

The date of the next session is set by the statutes for the year 1927, and it was unanimously voted to hold this meeting in America at an exact time and place to be chosen by the executive committee. The officers of the commission were re-elected by acclamation. In addition to Dr. Edward P. Hyde as president, these officers are three vice-presidents, Kenelm Edgcumbe of Great Britain, Guido Semenza of Italy and F. Rouland of France, and an honorary secretary and treasurer, C. C. Paterson of Great Britain.

The official report of proceedings of the session is in course of preparation by the central office, under the direction of the general secretary, J. W. T. Walsh of the British National Physical Laboratory. It will give the technical papers in the language in which they were presented, with summaries of the discussion in French. Copies of the proceedings will be available for distribution through the national committee or the various organizations represented on it, the American Institute of Electrical Engineers, the American Physical Society, Bureau of Standards, Illuminating Engineering Society and American Gas Association.

Push Better Home Lighting

New York City and Philadelphia Complete Organizations—More Firms Make Subscriptions

ORGANIZATIONS to push the better home-lighting campaign of the Lighting Educational Committee in New York and Philadelphia have been announced by the respective chairmen, Arthur Williams of the New York Edison Company and C. J. Russell of the Philadelphia Electric Company. Frank W. Smith was appointed vice-chairman of the New York committee and Clarence Law was elected secretary. Committees were appointed, including one on co-operative relations with T. I. Jones as chairman. The function of this committee, which is somewhat new in local organizations, is to acquaint the various organizations in the electrical industry with the activities of the committee and to obtain their support in furthering the work. This presents a problem in New York, where the industry has so many

COVER OF HOME-LIGHTING PRIMER USED IN CAMPAIGN

ramifications. Mr. Smith stated at the meeting that the model prize home which is on exhibit at Young's Million-Dollar Pier at Atlantic City has been purchased for exhibition in the New York Electrical Show. It will be made a registration point for children who wish to enter the home-lighting contest.

A comprehensive organization, representative of all the interests concerned in the industry, has been formed in Philadelphia to conduct the contest. It comprises a board of managers and nine functional committees, each with four to eight members especially selected with regard to its function. The board of managers comprises the officers, the chairman of the functional committees and four members at large. Charles J. Russell, second vice-president of the Philadelphia Electric Company, is permanent chairman, H. A. Lucas treasurer, and H. A. Parsons, Jr., secretary. A budget of $15,000 will be raised and it is expected that 70,000 primers will be needed.

In addition to the subscribers to the home-lighting campaign whose names have already been recorded in the ELECTRICAL WORLD (July 12, page 84), the following firms have pledged support in definite amounts:

American Transformer Company, Newark, N. J.
Benjamin Electric Manufacturing Company, Chicago.
Biddle-Gaumer Company, Philadelphia.
Crescent Art Metal Company, Bridgeton, N. J.
Crouse-Hinds Company, Syracuse, N. Y.
Duncan Electric Manufacturing Company, Lafayette, Ind.
Ferro-Art Lighting Fixture Company, New York City.
General Electric Company, Schenectady, N. Y.
Imperial Porcelain Works, Trenton, N. J.
Jefferson Glass Company, Follansbee, W. Va.
Novelty Lamp & Shade Company, Cleveland.
Phillips Wire Company, Pawtucket, R. I.
Pass & Seymour, Inc., Syracuse.
Edward N. Riddle Company, Toledo.
Safety Insulated Wire & Cable Company, New York City.
Shapiro & Aronson, New York City.
Tubular Woven Fabric Company, Pawtucket, R. I.
Westinghouse Electric & Manufacturing Company, Pittsburgh.
Voigt Company, Philadelphia.

Code Committees Appointed in Seventy-one Cities

Since its last convention the Association of Electragists International, through its code committee, of which A. Penn Denton is chairman, has endeavored to set up throughout the country local code committees composed of representatives of the several branches of the industry. Sixty-nine cities in the United States and two in Canada have already organized such committees. These cities are:

Alabama—Birmingham, Mobile.
Arkansas—Hot Springs, Little Rock.
Colorado—Colorado Springs, Denver.
California—San Francisco.
Connecticut — Hartford, New Haven, Waterbury.
Florida—Jacksonville, Miami, Tampa.
Georgia—Atlanta, Columbus.
Illinois—Decatur, Galesburg, Springfield, Peoria, Joliet.
Indiana—Indianapolis, Terre Haute.
Iowa — Cedar Rapids, Davenport, Des Moines.
Kentucky—Louisville.
Kansas—Kansas City, Pittsburg, Salina, Topeka, Wichita.
Louisiana—New Orleans, Shreveport.
Massachusetts—Boston.
Maryland—Baltimore.
Minnesota—Minneapolis, St. Paul.
Mississippi—Jackson, Vicksburg.
Missouri—Kansas City, St. Joseph.
New York—New York City.
Nebraska—Lincoln, Omaha.
New Jersey—Newark.
North Carolina—Raleigh.
Ohio—Columbus, Dayton, Springfield.
Oklahoma — Muskogee, Oklahoma City, Tulsa, Okmulgee.
Pennsylvania—Pittsburgh, Wilkes-Barre.
South Carolina—Charleston.
Tennessee—Memphis.
Texas—Dallas, Fort Worth, Houston, Beaumont, Galveston, San Antonio.
Virginia—Newport News, Norfolk, Richmond.
Wisconsin—Milwaukee, Sheboygan.
Washington, D. C.
Canada—Winnipeg, Toronto.

Virginia to Push Rural Electrification Movement

Arrangements were made last week at a meeting of the Virginia Committee on the Relation of Electricity to Agriculture, held in Richmond, for the immediate performance of the work of investigation necessary before definite plans can be formulated, and a fund of $5,000 was raised to carry forward this investigation. Sitting at the conference were representatives of several of Virginia's largest power plants, of state agricultural agencies and organizations and of the Richmond Chamber of Commerce. The plans adopted call for the employment of a man who will start to work on September 1 on a preliminary survey of the state. With this survey as a basis, demonstrations will be held at chosen localities.

St. Lawrence Power

Colonel Kelly Sees Need for Speeding Up Project to Meet Coming Imperative Demand

AFTER a detailed engineering study of the St. Lawrence River canalization and power project Colonel William Kelly, chief engineer of the Federal Power Commission and member of the St. Lawrence Joint Engineering Board, reports that before much further progress can be made extensive boring must be done, not only of dam sites, but at points where navigation structures are proposed. The Canadian sector of the improvement has been bored fairly well, Colonel Kelly says, except in the channel of the stream. The Canadians, he points out, have had at their disposal an appropriation of $50,000 a year for five years for this investigation. The amount has been increased to $100,000 this year. There is urgent need that corresponding field work be done on the American side, but no money is available for the purpose, although Colonel Kelly hopes that the money will be made available at the next session of Congress.

He entertains no doubts as to the time when this development should be started. In his opinion every effort should be made to bring in at least a part of the power at the earliest possible date. Since no less than ten years will be required before any power is made available, he anticipates that the power requirements of that portion of the United States which the project will serve will have reached a point before that time where the need for it will have become acute. In view of the probability that a much longer period may have to elapse before any of the St. Lawrence power is made available, because of the delays inherent in obtaining legislation and in the preparation and ratification of treaties, Colonel Kelly holds that no time should be lost in the necessary preliminary studies. Because the need for St. Lawrence power is imperative unless there be a large-scale shifting of industry from the Atlantic seaboard and western New York, he thinks that the financing of the project will not offer insurmountable difficulties, although rather intricate steps must be taken in Canada to prevent any increase in the tax burden which this generation of the Canadian people will have to pay. Canadian opposition to the project is losing ground rapidly, in Colonel Kelly's opinion.

Value of Interconnection Proved in Heavy Storm

The extremely severe storm that visited Wisconsin in common with other parts of the Middle West recently strikingly illustrated the advantages of the interconnection of electric transmission lines and at the same time forcefully demonstrated the helplessness of industries and homes dependent upon isolated power plants for electric service, according to John N. Cadby, executive secretary of the Wisconsin Utilities Association, who has completed a survey of reports received from electric light and power companies in the storm and flood area.

"Light and power consumers in Monroe, Baraboo, Prairie du Sac, Janesville and smaller intervening communities would have been forced to go back to the primitive days of the candle and oil lamp," said Mr. Cadby, "if the lines of the Wisconsin Power & Light Company, supplying these communities, were not interconnected to meet just such contingencies as this. With its Prairie du Sac power line to the north, which feeds these communities, put out of commission by the storm, connection was made within a short while with the company's power line from the south at Galena, Ill., and its steam plant at Monroe. These plants took up the load while the break in the Prairie du Sac line was located and repaired.

"The entire electrical industry," Mr. Cadby added, "is pushing the development of interconnection throughout the state. With the completion recently of a power line connecting Lena and Freeport, Ill., the tie-in links forty Wisconsin communities, extending as far north as Sheboygan, Oshkosh and Tomah, with St. Louis, Mo., Logansport, Ind., and Keokuk, Iowa. Thirty communities in northwestern Wisconsin, including La Crosse, Sparta, Neillsville and Eau Claire, are electrically connected with cities scattered over Minnesota and the Dakotas."

Pittsburgh Convention and Show of A. I. and S. E. E.

On September 15-20 the Association of Iron and Steel Electrical Engineers will hold its nineteenth annual convention at Pittsburgh, with headquarters at the William Penn Hotel. In connection with the convention the annual exhibition of the association, which this year has been named the "Million-Dollar Show," will be held at the Duquesne Garden. This show will, officials say, surpass any previous one. Virtually all the space has been sold to leading manufacturers, and arrangements have been made to care for fifty thousand visitors during the week. The exhibition will be open from 1 p.m. to 10 p.m. each day. From 9:30 a.m. to 1 p.m. the technical sessions of the convention will be held in the ballroom of the Duquesne Garden. The central stations in the Pittsburgh district and many steel plants will open their doors for the inspection of delegates.

New Merger Adds to Interconnection in Middle West

The formation of another interstate superpower area involving communities in Wisconsin, Minnesota and Iowa became a reality last week when the Wisconsin Railroad Commission approved the long-pending plans of the Utilities Power & Light Corporation of Chicago to merge the electric properties of the Southern Minnesota Gas & Electric Company of northern Iowa and Minnesota, the Interstate Power Company of northeastern Iowa and southwestern Wisconsin, the Bloomington (Wis.) Electric Light & Power Company, the Gays Mills (Wis.) Electric Company and the Soldiers' Grove (Wis.) Electric Company into a new company to be known as the Interstate Power Company. These companies supply light and power service to hundreds of cities, towns and villages in these three states. In order amply to take care of the present and future light and power requirements of the communities involved, plans are in the course of preparation whereby all of the company's steam and water-power properties in these states will be interconnected.

Delegates to Prague Meeting of Czechoslovakian Electrotechnical Association

Brief News Notes

Central Illinois Public Service Company Buys Plants.—The Central Illinois Public Service Company has purchased the Greenview (Ill.) Electric Light & Power Company and is authorized to acquire the electric property of the Carrier Mills (Ill.) Utility Company.

Edison Light & Power Purchases Glen Rock Company. — The Edison Light & Power Company of York, Pa., has purchased the Glen Rock Electric Light & Power Company, which serves ten boroughs in Pennsylvania and three places in Carroll County, Md., and has hitherto purchased power from the York company. Application for authority to merge the two companies will be made.

Great Western Power Company's Butte Valley Dam Is Finished.—The big dam of the Great Western Power Company, 7 miles below Lake Almanor, in the Butte Valley, Plumas County, Cal., has been finished and a 1,500-acre lake now covers what was once a well-known mining-camp site. The dam is 1,200 ft. long and of the hydraulic-fill type. It had been eight months in construction.

Lake Charles (La.) Utility Properties Sold. — It is announced by Luke C. Bradley of Houston, state agent of the Eastern Texas Electric Railway Company of Wilmington, Del., that that corporation has just purchased the electric light, street-railway, gas and water systems and plants in Lake Charles, La. This holding company already controls the electric light and power plants and the street-railway systems of Beaumont and Port Arthur, Tex. Its Texas headquarters are in Houston. It is reported that the purchase of the Lake Charles properties involved a total consideration of $1,000,000.

Electrified Mine Opened. — The Wabigon iron-ore mine near Buhl, Minn., said to be the first completely electrified open-pit mine of the kind in the country, was opened last week. The equipment is all of General Electric manufacture. Estimates of substantial savings are made by the engineers. The power cost for electric shovels, for instance, is but ½ cent per cubic yard of ore, compared with 2½ cents for steam shovels. Haulage costs are reduced one-half by use of electric locomotives, which have replaced heavier-type steam engines. The necessity for hauling coal to the mines is eliminated. Power for operation of the electrical equipment is furnished by a 22,000-volt line from the Minnesota Power & Light Company's system. One bank of transformers steps down the voltage to 2,200 for use of the electric shovels, and two other banks of transformers reduce the incoming voltage to 445 for use of the rotary converters, which deliver 600 volts direct current for the electric locomotives.

Continuous Lines from Kansas City to Keokuk in Sight.—Purchase by the West Missouri Power Company of the properties of the Tri-City Power Company at Bolivar and Stockton, Mo., is announced. The company will extend its transmission lines. These already reach from the city limits of Kansas City to within 45 miles of Springfield, Mo., which is served by the transmission lines of the hydro-electric plant at Powersite, near the Arkansas line on the White River. Lines run from Kansas north to the lines of the Continental Gas & Electric Corporation, which is connected with Clarinda, Iowa. From Kansas City to Keokuk, Iowa, gaps of only 65 miles remain.

Union Gas & Electric to Build Transforming Station at Carthage, Ohio.—A right-of-way 22 miles long has been obtained by the Union Gas & Electric Company, Cincinnati, for the construction of steel-tower transmission lines from the 80,000-kw. power station to be erected at Fort Miami on the Big Miami River to Carthage, Ohio, where an outdoor transforming station will be built. This will be one of the largest stations of its kind in Ohio. The eventual rating of the new power station at Fort Miami will be 240,000 kw., and the towers that will be erected along the right-of-way will be designed to carry three transmission lines of 80,000 kw. each. All this energy will be transformed at the Carthage substation.

Expansion of Tidewater Power Company.—The citizens of Whiteville, N. C., have voted to sell their municipally owned electric light plant to the Tidewater Power Company of Wilmington, N. C., which is controlled by A. E. Fitkin & Company, New York. The Tidewater company will take over the property at an early date. For some time this company has been extending its interests, and it supplies most of the communities and industries in the Wilmington district with power. The company will now extend its lines not only to Whiteville, but to Chadburn, Cerro Gordo, Fair Bluff and other towns in that region. The company some time ago extended its lines to Wallace and other towns north of Wilmington. The district which it is now entering is west and south.

Daytime Electric Signals. — Lights that can be seen in the daytime for several blocks will hereafter regulate the traffic of Broadway, New York City, between Rector and Eighty-sixth Streets, a distance of nearly 6 miles. Through the day the entire section will be so controlled, but after 6:30 p.m. only the section from Twenty-third Street to Eighty-sixth Street will be included. Sidewalk standards have been erected at intervals of six to eight blocks. Red, amber and green lights, visible up and down Broadway, are projected over the street from General Electric traffic signals suspended from ornamental bracket arms which reach about 6 ft. from the curb. Traffic along Broadway is allowed to move for a minute and a half, crosstown traffic for forty seconds. Between each change there is a period of ten seconds. The lights are not visible in the crosstown streets, vehicles there governing themselves by the traffic in Broadway. The twenty-seven units are now individually controlled but later will be remotely controlled by means of hermetically sealed mercury switches. They will be operated from designated master-control locations. The reflectors and lenses of the lights are so designed that they are easily visible at all times, day or night.

Sixty-six Iowa Municipal Plants Give Up.—At a special election on August 4 the town of Keosauqua, Iowa, decided to sell its municipal electric lighting plant to the Iowa Electric Company of Cedar Rapids. The vote was 321 in favor to 47 against. This makes sixty-six Iowa towns which have abandoned their municipal electric lighting ventures. Two other towns, Eddyville and Breda, are negotiating with private companies with a view to disposing of their plants.

Chemists to Discuss Fuel Problems.—The nation's fuel supply will be a chief topic of the fall meeting of the American Chemical Society, to be held at Cornell University, Ithaca, N. Y., September 8 to 13. Prof. S. W. Parr of the University of Illinois will lead round-table conferences on "The Storage of Coal and Spontaneous Combustion," and Secretary Hoover's plans to relieve coal shortage and the report of the coal storage committee of the American Engineering Council will be dealt with. The discussion will be participated in by J. K. Davis, W. D. Langtry, N. R. Beagle of Peoria, Ill., and W. H. Fulweiler of Philadelphia.

Tecumseh (Kan.) Plant Making Progress.—The Kansas Power & Light Company has work well under way on the construction of the steam plant at Tecumseh, Kan., near Topeka, which will ultimately be one of the largest in that state and have a capacity of approximately 100,000 hp. The foundations and excavation work are being finished and orders have been placed for most of the equipment. Work on the steel-tower transmission line to Atchison will begin soon. More than $500,000 has been spent so far on the construction of the plant, which will eventually cost in the neighborhood of $3,000,000.

Alabama Power Company Begins Work on Hopwood-Decatur Line. — Work on the 44,000-volt transmission line from Hopwood, Ala., near Muscle Shoals, to Decatur, a distance of about 50 miles, has been started by the Alabama Power Company, which, after two years of effort, received permission this summer from the Alabama Public Service Commission to build it. It will require several months to complete this line, which will cost approximately $500,000. At Decatur this line will connect with the Alabama Power Company's line to Huntsville, Ala. At a later date a new line of much higher voltage than the present one will be built from Huntsville to Decatur. With this improvement added a total new investment of about $1,000,000 is involved.

El Paso Electric Railway Company Enlarging Power Plant.—Construction of an addition to the present power plant of the El Paso (Tex.) Electric Railway Company, which supplies light and power, to house an additional 15,000-kw. generator is progressing rapidly. More than a million dollars is being spent on equipment and the addition to the building. The present boilers will supply steam for the new unit.

A Ewe Lamb Restored. — Fond du Lac, Wis., has long been known to fame. Fond du Lac, Minn., although one of the oldest towns in that state, is less prominent on the map. This, however, is no reason for ascribing the new hydro-electric plant which the Minnesota Power & Light Company has built in the smaller town to its Wisconsin namesake, as was inadvertently done two weeks ago on page 290. It is, as the context showed, the Minnesota Fond du Lac which boasts the water power. The Wisconsin city continues to depend on steam.

S. E. D. Issues Factory Lighting Booklet. — A twenty-four-page well-illustrated booklet, entitled "Better Factory Lighting Pays," for mailing to executives and managers of industrial plants, is just off the press of the Society for Electrical Development. It takes up every phase of the value of better lighting in factories and industrial plants and shows the benefits from improved illumination. Letters from Postmaster-General Harry S. New and other men of prominence tell what improved lighting has accomplished in various lines of industry.

Northwest Electric Light and Power Association Chairmen.—Appointments of section chairmen for the Northwest Electric Light & Power Association have been announced by President R. M. Boykin as follows: Accounting Section, A. N. Cudworth, Portland; Technical Section, H. H. Schoolfield, Portland; Commercial Section, J. F. Orr, Boise; Public Relations Section, W. H. Ude, Spokane. The following are the district chairmen of the Public Relations Section: Oregon, J. P. Lottridge, Baker; Washington, Norwood Brockett, Seattle; Idaho, R. B. King, Boise. W. A. White, Puget Sound Power & Light Company, Portland, is the new secretary and treasurer of the association.

Utilities Offer Public Assistance in Resuscitation. — With the swimming season at its height and accidental drownings increasing, the Wisconsin Public Utilities Bureau has announced that the utility companies are anxious to assist in spreading knowledge of resuscitation methods so that more lives may be saved. It is explained that employees of electric, gas, street-railway and telephone companies are especially trained in the prone-pressure system of reviving breathing and that the services of these employees are offered wherever needed. In cases of shock by electricity or suffocation by water or gas, where a doctor is not immediately available, the bureau asks that a call be made on the nearest utility company for first aid. All who wish to learn the prone pressure system will be instructed by utility companies.

Transmission-Line Map for Wisconsin.—Besides the comprehensive report on water powers in Wisconsin already noted in these columns, a map of transmission lines has just been made available by the Railroad Commission of that state. The map indicates the ownership and voltages, phases and frequencies of lines, the location of generating stations and substations and the communities served. Differentiation is made between the types of generating stations and the owners of generating stations and distribution systems.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See July 5 issue, page 50, for latest list.]

Conference of Electrical Leagues, Association Island, Henderson Harbor, N. Y., Sept. 2-6. Address Society for Electrical Development, 522 Fifth Avenue, New York.

Pennsylvania Electric Association—Bedford Springs Hotel, Bedford Springs, Pa., Sept. 3-6. H. M. Stine, 212 Locust St., Harrisburg.

Association of Edison Illuminating Companies—Griswold Hotel, New London, Conn., Sept. 8-12. P. S. Millar, 80th St. and East End Ave., New York.

Michigan Electric Light Association—Hotel Statler, Detroit, Sept. 9-11. Herbert Silvester, Edison Bldg., Ann Arbor, Mich.

New England Division, N. E. L. A.—Hotel Wentworth, Portsmouth, N. H., Sept. 10-13. Miss O. A. Bursiel, 149 Tremont St., Boston.

Rocky Mountain Division, N. E. L. A.—Hotel Colorado, Glenwood Springs, Col., Sept. 15-17. O. A. Weller, 900 15th St., Denver.

Colorado Public Service Association—Hotel Colorado, Glenwood Springs, Col., Sept. 15-17. J. F. Greenawalt, Mountain States Telephone & Telegraph Company, Denver.

Southeastern Division, N. E. L. A.—Birmingham, Sept. 15-18. E. T. O'Connell, Alabama Power Co., Birmingham.

Association of Iron and Steel Electrical Engineers—Duquesne Garden, Pittsburgh, Sept. 15-20. J. F. Kelly, 513 Empire Building, Pittsburgh.

Great Lakes Division, N. E. L. A.—French Lick, Ind., Sept. 24-27. R. V. Prather, Illinois Mine Workers' Bldg., Springfield, Ill.

Electrical Supply Jobbers' Association, Pacific Division—Del Monte (Del Monte Lodge, Pebble Beach), Cal., Sept. 25-27. Albert H. Elliot, 502 Flatiron Bldg., San Francisco.

Association of Electragists International—West Baden Springs, Ind., Sept. 29-Oct. 4. L. W. Davis, 15 W. 37th St., New York.

American Electrochemical Society—Hotel Fuller, Detroit, Oct. 2-4. Colin G. Fink, Columbia University, New York.

American Electric Railway Association—Atlantic City, N. J., Oct. 6-10. J. W. Welsh, 8 West 40th St., New York.

Empire State Gas and Electric Association—Lake Placid Club, N. Y., Oct. 6-7. C. H. B. Chapin, Grand Central Terminal, New York.

American Institute of Electrical Engineers—Pacific Coast convention, Pasadena, Cal., Oct. 13-17. F. L. Hutchinson, 33 West 39th St., New York.

Electric Power Club—Greenbriar Hotel, White Sulphur Springs, W. Va., Oct. 20-23. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

Kansas Public Service Association—Broadview Hotel, Emporia, Kan., Oct. 24-25. R. T. Smalley, Kansas Electric Power Co., Emporia.

Illuminating Engineering Society, Briarcliff Manor, N. Y., Oct. 27-31. N. D. Macdonald, 29 West 39th St., New York.

Canadian Exports of Hydro-Electricity.—According to government figures there was exported from Canada during the month of June this year a total of 100,498,213 kw.-hr. of electrical energy. Eight companies shared in this business during the month. The Cedars Rapids plant in Quebec took the lead, sending 38,418,000 kw.-hr. across the border, and the Ontario Hydro-Electric Power Commission took second place with 31,743,800 kw.-hr.

Transmission System of Interstate Public Service Company. — The Interstate Public Service Company of Indianapolis has just completed its 66,000-volt transmission line from Connersville, Ind., to the Indiana and Ohio state line, near Hamilton, where connection is made with the United Gas & Electric Company of Cincinnati. This line, which will provide ample power for the Connersville-Newcastle district for several years, was built in record-breaking time, having been started on April 8 this year. The Interstate is erecting a new transmission line between Bloomington and Ellettsville, Ind., and is also changing a 13,000-volt line over to carry 33,000 volts in order to provide sufficient power for the stone industry in the Bloomington-Ellettsville district.

New Oklahoma Company Projected. —According to reports from Enid, Okla., there is to be a consolidation of nine electric properties northwest of that city which have hitherto been operated under the name of the States Power Company. It is said that this company, which has maintained a somewhat loose organization of the properties concerned, has sold its interests in the nine cities to the Public Utilities Investment Company and that a new concern, to be known as the United Power Company of Oklahoma, will acquire them and other properties in the surrounding territory. The nine towns are Helena, Jet, Nash, Goltry, Meno, Lahoma, Kremlin, Pond Creek and Jefferson. Nathan L. Jones of Salina, Kan., is the prospective head of the new company.

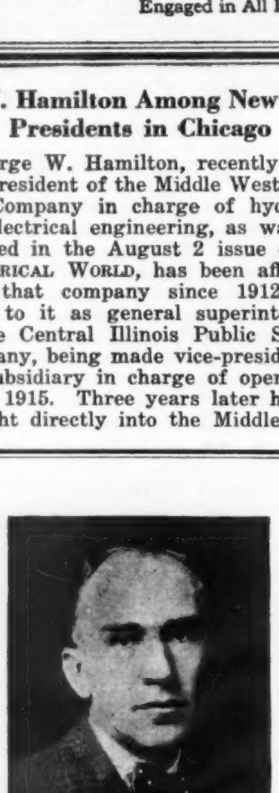
Hydro-Electric Survey Proceeding at Grand Falls, New Brunswick.—Conditions for hydro-electric development on the St. Johns River at Grand Falls, New Brunswick, Canada, are better than was anticipated when the project was launched, according to a report submitted to Washington by the American Vice-Consul at Fredericton, N. B. Complete detail surveys show that the preliminary estimates were conservative, he says. Several months will be required to complete the survey and before it will be proper to make formal application to the International Waterways Commission in order to develop the site. This application is necessary because some of the works will affect in a small measure the foreshore of citizens of Maine. The project, it will be recalled, is under the authority of the New Brunswick Electric Power Commission. The initial plan is to develop 40,000 hp. on the Canadian side of the falls, but ultimately to develop 120,000 hp., provided satisfactory arrangements can be made for storage dam sites in Maine.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in All Branches of the Electrical Industry

G. W. Hamilton Among New Vice-Presidents in Chicago

George W. Hamilton, recently made vice-president of the Middle West Utilities Company in charge of hydraulic and electrical engineering, as was announced in the August 2 issue of the ELECTRICAL WORLD, has been affiliated with that company since 1912. He came to it as general superintendent of the Central Illinois Public Service Company, being made vice-president of the subsidiary in charge of operations about 1915. Three years later he was brought directly into the Middle West



G. W. HAMILTON

Utilities Company as electrical engineer, later taking on hydraulic engineering work as well. His entry into the electrical business was made in 1900, when he joined the Stanley Electric & Manufacturing Company, going through the shop, test room and design departments in the six years he was at Pittsfield, Mass. In 1906 he affiliated himself with the Connecticut Company at New Haven as assistant engineer of power and lines, remaining with it for three years of the period, during which considerable development and extension work in New England was carried on. Then he associated himself with the Rockland Light & Power Company, Nyack, N. Y., for three years as plant superintendent, leaving that position to join the Central Illinois Public Service Company.

Elmer T. Gilbert, formerly assistant superintendent of construction with the Narragansett Electric Lighting Company, Providence, has been appointed superintendent of construction, succeeding the late Edward F. Latimer. Mr. Gilbert entered the public utility field in 1899 in electric railway service at New Haven, Conn. He joined the staff of the Providence company in 1914 after a wide experience in transmission and distribution line construction and maintenance.

J. V. Riley of Waukon, Iowa, has been appointed manager of the Interstate Power Company at Decorah, Iowa, succeeding William Scally, recently transferred to McGregor.

A. L. Fuller, formerly connected with the Muscatine (Iowa) Gas Company, has joined the People's Light Company, Davenport, Iowa, in charge of advertising and sales promotion.

M. A. Sitton, formerly an assistant to the superintendent of distribution and installation for the Virginia Railway & Power Company, Richmond, Va., has been appointed superintendent of installation.

Jahn Immonen, director of a large electrical company at Pusula, Finland, has arrived in Canada to make a comprehensive study of electrical problems. He has been engaged for fourteen years in electrical work.

T. W. Bracken Reid has been appointed manager of the Public Utilities Commission of Port Arthur, Ontario, to succeed M. M. Inglis, who, as was announced in the July 26 issue of the ELECTRICAL WORLD, is leaving for Brazil.

Charles L. Edgar, president of the Edison Electric Illuminating Company of Boston, has been elected chairman of the New England Bureau of Public Service Information, whose headquarters are in the Massachusetts capital.

H. E. Pawson, who has been in charge of the engineering department of Nesbitt, Thompson & Company for some time, has been appointed by the board of the Ottawa-Montreal Power Company to the post of general manager of that company.

M. Graham Fulton, for many years treasurer of the Mexican Light & Power Company, Ltd., Mexico City, has resigned to affiliate himself in a similar capacity with the companies controlled by the Brazilian Traction, Light & Power Company, Ltd.

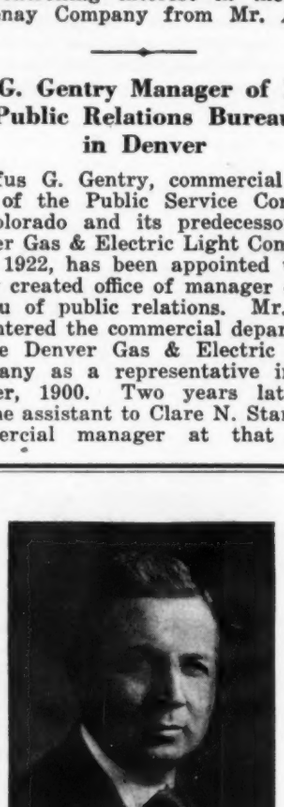
George A. Mills, for the past six years general superintendent in charge of the Northern States Power Company's light, power, gas and electric railway properties in Wisconsin, has left the services of that company to become connected with the public service enterprises at Kewanee, Ill.

Theodore D. Moore, for the past seven years manager of the Corry (Pa.) office of the Venango Public Service Company, has resigned, effective September 1, to take up a Western assignment with the General Engineering & Management Corporation, New York City, after a winter's sojourn in Florida.

A. J. Nesbitt has been elected president of the East Kootenay Power Company, Ltd., Fernie, B. C., to succeed A. E. Appleyard of Minneapolis, who remains on the board of directors. The Montreal investment house of Nesbitt, Thomson & Company recently acquired the controlling interest in the East Kootenay Company from Mr. Appleyard.

R. G. Gentry Manager of New Public Relations Bureau in Denver

Rufus G. Gentry, commercial manager of the Public Service Company of Colorado and its predecessor, the Denver Gas & Electric Light Company, since 1922, has been appointed to the newly created office of manager of the bureau of public relations. Mr. Gentry entered the commercial department of the Denver Gas & Electric Light Company as a representative in November, 1900. Two years later he became assistant to Clare N. Stannard, commercial manager at that time.



R. G. GENTRY

After serving in this capacity for a score of years he was appointed commercial manager in the spring of 1922, when Mr. Stannard ascended to the general managership.

Mr. Gentry has made many friends for this company through his civic and social as well as his business activities, having served as director for the Denver Manufacturers' and the Colorado Manufacturers and Merchants' associations and in an executive capacity in the Doherty men's fraternity from time to time. Upon his leaving the office of commercial manager to assume his new duties, Mr. Gentry was presented by the members of the commercial department with a watch as a token of the esteem in which he was held by those who daily worked with him.

Eric Wilburn Smith, central-station salesman and assistant manager of the General Electric Company, St. Louis office, has joined the staff of Ray D. Lillibridge, Inc., engineers and general advertising agents, New York City. Mr. Smith will devote himself particularly to furthering the interest of this agency's clients in the electric light and power industry of the country. Mr. Smith is a graduate of the Georgia

School of Technology with a degree of B. S. in electrical engineering. After working in the motor and transformer department of the Union Electric Light & Power Company of St. Louis and the testing and engineering department of the Lynn works of the General Electric Company, he joined the sales organization of the latter, specializing first in motors and later in central-station work.

S. F. Bates, formerly with the Bristol (Tenn.) Gas & Electric Company, became new-business manager of the Macon (Ga.) Railway & Light Company on July 1.

William Scally, who has been manager of the Interstate Power Company at Decorah, Iowa, has been transferred to McGregor to assume larger responsibilities at that office.

A. Miltenberger has been appointed Western executive representative of the Wagner Electric Corporation, St. Louis, with headquarters in San Francisco.

M. C. Giger, formerly with the Iowa Service Company at Red Oak, is now superintendent for the company at Griswold, succeeding W. E. Edwards, resigned.

H. B. Clark, formerly electrical engineer with the New York, New Haven & Hartford Railway, has become electrical designing engineer with the Solvay Process Company, Solvay, N. Y.

Joseph C. Bowman, advertising manager of the Packard Electric Company, Warren, Ohio, will open up an industrial advertising agency under his own name in Cleveland on September 1. Mr. Bowman was formerly manager of the Cleveland district office of the Standard Underground Cable Company for five years and more recently served as manager of the electrical department of the H. W. Johns-Manville Company at Cincinnati.

A. J. Calloway, who for the last four years has been manager of the Salt Lake branch of the Western Electric Company, has been promoted to the management of the Indianapolis office of the company. Mr. Calloway has been connected with the company almost continually since his graduation from the University of Colorado in 1912. Prior to going to Salt Lake City, he was with the San Francisco and Chicago offices of the company.

James M. Perlewitz, who has been identified with the sales department of the Salt Lake branch of the Western Electric Company, has been promoted to the position of manager of that branch to succeed A. J. Calloway, recently appointed manager of the Indianapolis office. Mr. Perlewitz' period of service with the Western company covers ten years, all of which has been spent at the Salt Lake branch.

Lloyd Garrison of Salt Lake City, Deputy State Engineer of Utah since April, 1921, has been appointed State Engineer to succeed R. E. Caldwell, resigned. Following his graduation from the University of Illinois in 1907 with a degree in electrical engineering, Mr. Garrison took an apprenticeship course with the Denver Gas & Electric Company in gas and electrical engineering. Subsequently he became associated with the Utah Light & Railway company in Salt Lake City, a predecessor of the Utah Power & Light Company. He served with this organization in the capacity of commercial engineer until the latter part of 1915. In the meantime Mr. Garrison had been studying law and was admitted to the bar of Utah early in 1916. Owing to his legal training and his experience in the work of the State Engineer's office, gained during the past three years, Mr. Garrison is exceedingly well qualified to handle the duties of his new position as state engineer.

A. J. Authenreith Receives Promotion

A. J. Authenreith, who has been elected a vice-president of the Middle West Utilities Company in charge of ice making and refrigeration, was chief engineer of the Mattoon (Ill.) Heat, Light & Power Company two years

A. J. AUTHENREITH

before it became a part of the Central Illinois Public Service Company (a subsidiary of the Middle West Utilities Company) in 1905 and continued in that position until 1917. Then he became directly connected with the Middle West Utilities Company, engaging in general engineering work, principally the refrigeration end, the company now having sixty-four ice plants in its subsidiary companies. Mr. Authenreith's experience in artificial refrigeration dates back, however, to 1896, when he was connected with the Twin Cities Ice & Storage Company, Champaign, Ill. He remained there until 1898, when he became associated with the municipal plant in Mattoon, Ill., staying there until 1903, when he took the position previously referred to with the Mattoon Heat, Light & Power Company.

Ezra H. Day has severed his connection with the Standard Underground Cable Company and has joined the Engineering Equipment Company as sales engineer. This company is an agent for the Condit Electrical Manufacturing Company, Boston, and for the Packard Electric Company, Warren, Ohio.

John K. Stafford has resigned as instructor in mathematics at Rensselaer Polytechnic Institute to enter the lightning arrester department of the General Electric Company, Pittsfield, Mass.

E. C. Goddard, for a number of years associated with the electrical department of the Underwriters' Laboratories, Chicago, has resigned to join the Jefferson Electrical Manufacturing Company of Chicago.

Rutherford R. Rowell, a graduate of Purdue University, class of 1922, and now connected with the Utah Power & Light Company as hydro-electric engineer, has been promoted to the office of division superintendent and has received charge of the Idaho division.

E. W. Quiggle, for the past two years in charge of the Wilkes-Barre office of the Ridgway Dynamo & Engine Company, is now in the factory office of the company at Ridgway, Pa.

Peter G. Rimmer, for many years in charge of the Wilkes-Barre office of the Ridgway Dynamo & Engine Company, has resigned the position which he has held for the last two years with the Scranton Electric Construction Company, to again be in charge of the Ridgway office at Wilkes-Barre.

Lyle G. Fear, who has been in the service of the Westinghouse Electric & Manufacturing Company for the past fifteen years, was recently appointed manager of the Portland (Ore.) branch office. Mr. Fear was formerly on the sales force of the company's office in Butte, Mont., and Spokane, Wash., and has been identified with the Portland branch since 1912.

Obituary

Col. George L. Shepley, director of the Narragansett Electric Lighting Company, the Westerly Light & Power company and other public service corporations, died August 3 at his summer home on Warwick Neck, R. I. Mr. Shepley was head of the insurance concern of Starkweather & Shepley, as well as director of many banks and industrial firms. He was seventy years of age.

Myron L. Ferguson, for the past six years superintendent of the Conneautville (Pa.) plant of the Burke Electric Company, Erie, died at his home in the former city on July 30, following an hour's illness of neuralgia of the heart. Mr. Ferguson was president of the local board of education, a member of the Chamber of Commerce and prominent in Masonic circles.

F. J. T. Stewart, superintendent of the New York Board of Fire Underwriters, died suddenly August 6 of pneumonia at his home in Summit, N. J. Mr. Stewart, who was a graduate in electrical engineering of Cornell University, served at one time as president of the National Fire Protection Association.

C. A. Duncan, president of the American Carbolite Company and the Carbic Manufacturing Company, Duluth, Minn., died at his home in that city, July 13, following a ten weeks' illness, at the age of sixty-six years. He was instrumental in organizing and financing the Northern Power Company and became its first president.

Financial and Corporate

Utility Issues Rally

Smart Gains Made by Numerous Leaders as Trading Turns Livelier in All Groups

THE utility markets had been relatively dull for a time, and the industry still is in its slowest period seasonally, but last week trading took on fresh life. The proposal of the American Power & Light directors to split the company's common shares on a ten-to-one basis seemed to start things going. At least business has been brisk since then and prices have worked forward in smart fashion. There have been favorites, of course, but the general trend has been in one direction—upward.

Although the Street had thought for weeks that the American Power & Light shares would be divided into smaller pieces and had been discounting the event in the prices bid for stock, the announcement did not bring more profit-taking sales than the market was able to absorb. Indeed, it seemed only to widen the volume of buying orders and sent the old stock on to another high for all time at 405. The new shares on a "when issued" basis sold at about a tenth of that level. Now being available in smaller denominations, American Power & Light shares have attracted many small investors. Once the plan was announced, traders turned their attention to the smaller shares and dealt in them actively. Since the new shares will not be issued until later in the year and need not be paid for at this time, the speculative incentive was greater in them than in the outstanding stock.

Next to this issue Commonwealth Power Corporation shares made the most impressive performance. These shares, which until recently had been quiet, got suddenly stronger and crossed par for the first time in their history. The net gain for the week of 7½ points is not so large actually as that of 66 points made by American Power & Light, but the difference is not so great relatively. Commonwealth Power Corporation's earnings have held up well during the summer, and there is the possibility of an increase in the dividend rate soon, two things that make for strength in the stock. Carolina Power & Light gained fifteen points and numerous issues gained two or three points on the week.

Decline in New Offerings

Following a period unusually brisk for midsummer financing, new issues of electric light and power securities slumped considerably both in number and in volume during the past week. The issue of $10,000,000 of North American Company 6 per cent preferred stock, originally offered to stockholders, as was announced in the August 9 issue of the ELECTRICAL WORLD, was placed on public sale less the amount subscribed by stockholders. The New York Central Electric Corporation issued 5½ per cent mortgage bonds, amounting to $2,100,000, the price being 97 and the yield 5.70 per cent. The Cumberland County Power & Light Company of Portland, Me., recently made an addition to its steam plant and with the purpose of raising funds for a portion of the cost the company issued cumulative preferred stock to the amount of $1,000,000. Represented among the smaller issues were the Chester County Light & Power Company with an offering of $200,000 in mortgage bonds and the Consumers Power Company of Delaware with an offering of $450,000 in first lien sinking-fund gold bonds.

Company Reports

Among the company reports issued during the past week for the month of June are the following:

Name of Company	Gross Revenue June, 1924	June, 1923
Adirondack Power & Light *..	$535,871	$508,118
American Water Wks. & Elec.	3,024,790	2,991,371
Edison Electric Illuminating Company of Boston.....	1,420,523	1,295,969
Grafton County Electric Light & Power *.....	14,669	13,282
Havana Electric Railway, Light & Power.....	1,158,386	1,103,750
Massachusetts Lighting Cos.	272,388	260,711
New Bedford Gas & Edison Lt.	255,297	295,178
Penn Central Light & Power..	285,622	252,114
Southern Utilities *.....	235,783	189,587
West Penn.....	1,988,682	1,982,291
York Utilities *.....	12,754	21,886

* July

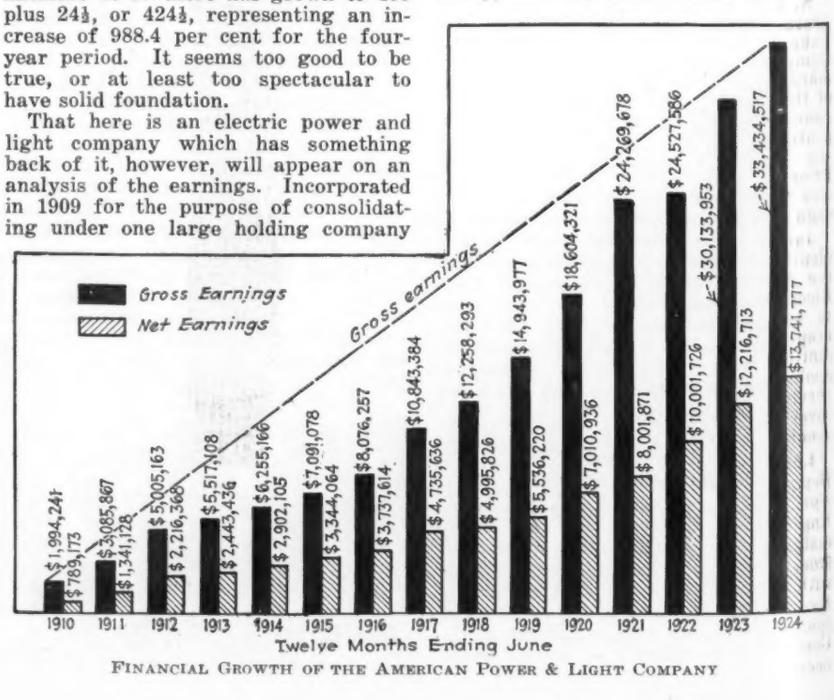
American Power & Light Growth

This Unique Utility Has Shown Earning Increases Monthly for Fifteen Years, and Now, with the Stock Valued at 400, Will Split the Shares

BY PAUL WILLARD GARRETT

LESS than four years ago, in 1921, a share of American Power & Light Company's common stock could have been bought for 39. Almost enough has been received in dividends since then to pay for stock at that price, not to mention the appreciation in the value of the shares. No Wallingford tale contains more romance than may be found in the rapid rise of American Power & Light shares, but there is this difference that one is fiction and the other fact. The common shares of this great utility reached 405 in the market on Wednesday (they were 355 when stock was split). The man who has hung on since his purchase at 39 has received $18.50 in cash and $6 in stock dividends. Altogether, his commitment at 39 there has grown to 400 plus 24½, or 424½, representing an increase of 988.4 per cent for the four-year period. It seems too good to be true, or at least too spectacular to have solid foundation.

That here is an electric power and light company which has something back of it, however, will appear on an analysis of the earnings. Incorporated in 1909 for the purpose of consolidating under one large holding company various properties in position to grow, the American Power & Light Company has enjoyed a growth that represents almost a unique chapter in utility history. Gross earnings of the subsidiary operating companies totaled $1,994,241 for the twelve months ended June, 1910. The company issues statements monthly to cover earnings for the preceding twelve months. Each of these monthly statements, covering the entire history of the American Power & Light Company, shows an increase over the corresponding previous period. By steady gains for fifteen years the company's gross earnings have grown from $1,994,241 for the twelve months ended June, 1910, to $33,434,517 for the twelve months ended June, 1924. Certainly, the American Power & Light

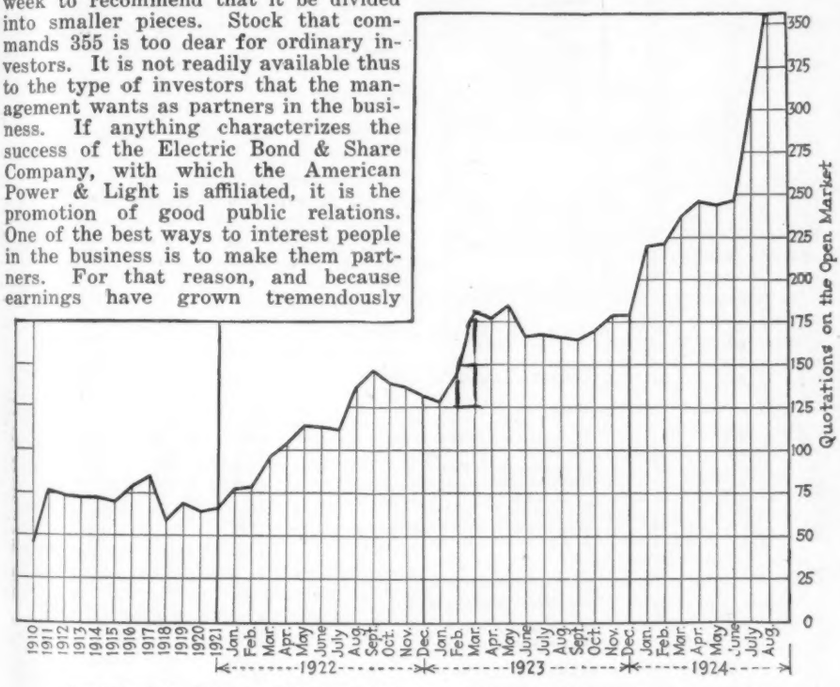


FINANCIAL GROWTH OF THE AMERICAN POWER & LIGHT COMPANY

Company is getting business at an ever-increasing rate, and, what is more, the gains in net therefrom are just as impressive. Net earnings for the twelve months ended June, 1910, totaled $789,173, but they, also by steady gains in every twelve-month period for the last fifteen years, have grown to $13,741,777 for the twelve months ended June, 1924. Annual gross earnings have increased 16.8 times and net 17.7 times.

Now Plans to Split Shares

The persistent growth in earnings helps to explain the rise in the value of the stock, and the higher price for the stock prompted the directors last week to recommend that it be divided into smaller pieces. Stock that commands 355 is too dear for ordinary investors. It is not readily available thus to the type of investors that the management wants as partners in the business. If anything characterizes the success of the Electric Bond & Share Company, with which the American Power & Light is affiliated, it is the promotion of good public relations. One of the best ways to interest people in the business is to make them partners. For that reason, and because earnings have grown tremendously with respect to the volume of common stock outstanding, the company now plans to divide the present shares on a ten-to-one basis.



Spectacular Rise in Price of American Power & Light Common Stock

What this would mean is easy enough to see. There are now 144,774 shares of common outstanding, representing $14,477,400 in par value. The directors simply want to split each share into ten new shares. The present 144,774 shares would be replaced by 1,447,740 shares of new stock. Instead of 400 for each share, the stock would command only about 39½ or 40½. Wisely, while the directors were at the job they proposed to change the shares from $100 par value to no par value. Such a step does not alter the value of the stock intrinsically, of course, and it frees the company from several technical restrictions.

Should Help Investment Position

There is nothing new about such a split-up in the common shares, and it involves nothing which investors need to fear. The American Gas & Electric Company, also affiliated with the Electric Bond & Share Company, made a similar move early in 1923. The stock in that case was divided on a five-to-one basis, but, since the par value of the old stock had been $50, it amounted to the same thing. The split-up in that case involved no change in dividend policy. While nothing has been said, the presumption is that the American Power & Light Company will continue its former dividend policy. It now pays $10 in cash and $4 in stock annually and, if no change in policy occurs, will pay one-tenth as much on the divided shares. Incidentally, the division of the American Gas & Electric shares has done no harm to old investors. It has been a good thing for them marketwise. Although the new shares sold earlier in the year at 48, they now command about 75, or 375 on the old basis. Hundreds of small investors can purchase stock at present who could not handle the larger pieces.

With the announcement that the American Power & Light Company will divide its shares, on the approval of the stockholders, comes the interesting announcement that this utility has bought electric power, light and railway properties at Miami Beach, Fla., and gas properties at Miami. Operation of the new properties will be undertaken by a company to be called the Florida Power & Light Company. It now may be said that the American Power & Light properties reach from the Atlantic Ocean to the Pacific, covering, so far as is known, a greater stretch of territory than is covered by any other power and light company in the world. From the Florida everglades to the fishing village of Astoria, Ore., is a long span, but it is one that American Power & Light now makes.

If it be objected that this company's operating properties are too scattered to permit of interconnections and such savings as might result therefrom, it may be answered that the system is large enough for several different superpower systems. To be sure, the properties are not compact enough to connect Walla Walla, Wash., with Fort Worth, Tex., perhaps, but there is another side of the story to consider. It has to do with the diversity represented by American Power & Light properties. Here are some of the leading subsidiaries: (1) The Kansas Gas & Electric Company, serving Wichita and other Kansas communities; (2) the Pacific Power & Light Company, which serves such places as Yakima and Walla Walla, Wash.; Astoria, Pendleton and Hood River, Ore., and sixty-six other communities in the Northwest; (3) the Portland Gas & Coke Company; (4) the Nebraska Power Company; (5) the Minnesota Power & Light Company, which serves numerous important mining and agricultural sections in northern Minnesota; (6) the Florida Power & Light Company; (7) the Southwestern Power & Light Company, which in turn controls such companies as the Texas Power & Light Company, Fort Worth Power & Light Company, El Paso Gas Company, Galveston Gas Company, Wichita Falls Electric Company and other companies giving utility service in more than 150 Texas communities. In all 396 different communities are served in ten states.

A large holding company which derives 76 per cent of its gross revenues from the sale of electricity in sections like these is in position, obviously, to offer its security holders a pretty good investment risk. Business in one section can decline materially without greatly lessening the total earnings for the parent company. Depression in the Northwest may be offset by prosperity in the Southwest, for example. While the territory served as a whole is not compact, the various units are themselves compact and are well picked for the possibility of future growth.

Dividends Declared

The following quarterly dividends were announced by central-station companies and electrical manufacturing companies during the seven-day period ended August 19:

Name of Company	Per Cent	When Payable
American Power & Light	2½	Sept. 1
Northern Texas Electric, pf*	$3	Sept. 2
Northern Texas Electric, com.	$2	Sept. 2
Northwestern Public Service, pf.	1¾	Sept. 1
Philadelphia Electric, pf.	50c.	Sept. 15
Philadelphia Electric, com.	50c.	Sept. 15
Southwestern Power & Light, pf.	1¾	Sept. 1
Standard Gas & Elec, 8 per cent pf.	2	Sept. 15
Chicago Flexible Shaft, pf.	1¾	Sept. 1
Foundation Company, pf.	$1.75	Sept. 15
Foundation Company, com.	$1.50	Sept. 15
Vesta Battery, pf.	1¾	Sept. 1

* Semi-annual.

New York Corporation Seeks Additional Franchises.—The New York Central Electric Corporation of Perry, Wyoming County, N. Y., and New York City, has made application to the Public Service Commission for permission to acquire the franchises, stations and systems of the Aulls Electric Corporation and F. R. Aulls as an individual, of Campbell, Steuben County; the Springwater Electric Light Company, the Addison Electric Light & Power Company and the municipal electric plant of the village of Arkport. Previous acquisitions of the New York Central Electric Corporation have been noted in these columns.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par value of stocks is $100.)

Companies	Bid Price Saturday, Aug. 16	Low 1924	High 1924
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	95	94	97¼
Appalachian Power, 7 per cent	87½	85½	90
Arkansas Light & Power 7 per cent	90	81	93
Asheville Power & Light 7 per cent	96	96	99
Carolina Power & Light 7 per cent	98	95½	100
Central Illinois Public Service 6 per cent	84	84	87
Colorado Power 7 per cent	93	90	97
Connecticut Light & Power 7 per cent	99	99	102
Consumers' Power 6 per cent	89	85	93
Dayton Power & Light 6 per cent	84	84	90
Duquesne Light 7 per cent	105	103⅓	107½
Eastern Texas Electric 6 per cent	95	81	95
Empire District Electric 6 per cent	73	70	78
‡ Erie Lighting	a 28½	23½	30
Fort Worth Power & Light 7 per cent	97	97	100
Great Western Power 7 per cent	97	96	98
Illinois Northern Utilities 6 per cent	82	82	87
Illinois Power & Light 7 per cent	92½	84	95
Kansas Gas & Electric 7 per cent	93	92	97
Long Island Light 7 per cent	98	95	98
Minnesota Power & Light 6 per cent	80	78	87
Mississippi River Power 6 per cent	87	80	90
Nebraska Power 7 per cent	96	89	99
Niagara Falls Power 7 per cent—25	a 28½	27	28½
Niagara, Lockport & Ont. Power 7 per cent	101	99½	104½
Northern States Power 7 per cent	94	91	97
Ohio Public Service 7 per cent	92	86	94½
Pacific Gas & Electric 6 per cent	90	85½	92½
Penn-Ohio Power & Light 7 per cent	91	84	96½
Pennsylvania Power & Light $7—no par	98	93	99
Penn. Public Service 7 per cent	90	90	100
‡Philadelphia Electric 8 per cent—25	a 39½	29	39¼
Southern California Edison 8 per cent	115	112	119
Tennessee Electric Power, 6 per cent	76½	71	79½
Texas Power & Light 7 per cent	95½	95	96½
Utah Power & Light 7 per cent	96	94	96½
Western States Gas & Electric 7 per cent	78	78	85
Yadkin River Power, 7 per cent	95¼	94	96¼
Holding Companies			
American Gas & Electric 6 per cent—50	44½	41½	46
American Light & Traction	91	91	94½
American Power & Light 6 per cent	89	84	91
American Public Service 7 per cent	84	84	88
American Public Utilities 7 per cent	79	73	85
American Water Works & Electric 6 per cent	92	66	99
Carolina Power & Light	98½	95½	99
Central Indiana Power 7 per cent	86	80	90
Cities Service 6 per cent	73½	67	75
Commonwealth Power	a 78½	72	82
Consolidated Gas 6 per cent—50	58½	51	59½
Continental Gas & Electric 7 per cent	85	69	90
Electric Bond & Share 6 per cent	101	96½	103
General Gas & Electric—$8—no par	100	96	101½
Middle West Utilities 6 per cent	88	80	90
National Power & Light—$7—no par	91½	84	96½
North American 6 per cent—50	a 49½	43½	50½
Northern Ohio Electric	a 27	16	34
Public Service Corp. of N. J. 7 per cent	97¾	96½	100
Public Service Corp. of N. J. 8 per cent	107	99½	108½
Standard Gas & Electric 8 per cent—50	49	46½	49½
‡United Gas Improvement—50	a 57½	55½	58
United Light & Power—$6.50—no par	79¼	75¼	80
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	31	22½	34
Appalachian Power—no par	72½	66½	93
Arkansas Light & Power	54	22	58
Brooklyn Edison	a 117	107½	117½
Buffalo General Electric	145	118	150
Carolina Power & Light	152	82½	155
Colorado Power	33	21	35
Commonwealth Edison	126	126	135
§Consolidated Gas, Electric Light & Power	a 116½	113	117
Dayton Power & Light	115	70	120
Detroit Edison	a 109½	102½	110½
|| Edison Electric Illuminating of Boston	a 190	163½	190
*Kentucky Hydro-Electric	87½	85½	87½
Long Island Lighting	150	100	185
Mississippi River Power	29	18½	31
Montana Power	a 69½	61¼	71
Niagara Falls Power—no par	42	45	48
Niagara, Lockport & Ontario Power—100	53	45	59
Northern Ohio Electric—no par	10	5	16
Northern States Power	99	92	106
North Texas Electric	61	58	84
Pacific Gas & Electric	a 95½	90½	96½
‡Penn Central Light & Power—no par	59½	57	60
Pennsylvania Water & Power	107	98½	110
‡Philadelphia Electric—25	a 39½	29	39½
Public Service Co. of Northern Illinois	97	97	104
Puget Sound Power & Light	59	43½	61½
Southern California Edison	97	95	106
Tampa Electric	155	134	160
Tennessee Electric Power—no par	34½	20	40½
Virginia Power	45	16	60
Virginia Railway & Power	a 65½	36	72¾
West Penn. Co.	a 89½	47½	98

Companies	Bid Price Saturday, Aug. 16	Low 1924	High 1924
Holding Companies			
‡American Electric Power—50	62	22½	62¾
American Gas & Electric—no par	75½	43½	78½
American Light & Traction	128	115	140½
American Power & Light (old)	a405	220	405
American Power & Light (new)	a 40½	34½	40½
American Public Utilities	78	35	80
American Water Works & Electric	a109	40	117½
Carolina Power & Light—no par	159	103	159
Cities Service	143	140	155
Columbia Gas & Electric—no par	a 40½	33	42½
Commonwealth Power Corp.—no par	99	56	99
Consolidated Gas—no par	a 72½	60½	72½
Continental Gas & Electric	64½	49	65½
Federal Light and Traction	79	70	83
General Gas & Electric	50	22	55
Lehigh Power Securities—no par	75	31	81½
Middle West Utilities—no par	56	41	60
National Power & Light—no par	145	60	148
Philadelphia Co.—50	a 50½	42½	53½
Power Securities—no par	9	4	14
Public Service Corp. of N. J.—no par	a 59½	39	59½
Standard Gas & Electric—no par	a 35⅝	31½	37⅝
United Gas & Electric (Conn.)—no par	33	14	42
Utah Securities	a 31½	16½	32
BONDS			
Operating Companies			
Adirondack Power & Light 6s 1950	102½	97½	102½
Alabama Power 5s 1946	95½	90½	96
Appalachian Power 5s 1941	94	89	94½
Brooklyn Edison 5s 1949	a 100¾	97½	102½
6s 1930	105	102½	106
7s 1940	a 109½	107	110
Central Indiana Power 6s 1947	93	88	95
Commonwealth Edison 5s 1943	99½	95	100
5s 1953	a 98½	92	99½
§Consol. Gas, Elec. Lt. & Pwr. 4½s 1935	94½	91½	95
6s 1949	104½	101½	105
6½s 1951	a108½	107	108½
Consumers' Power 5s 1936	98½	94½	99½
5s 1952	92½	87	92½
Duquesne Light 6s 1949	a105½	103½	106½
Great Western Power 5s 1946	95	90½	96
Kansas City Power & Light 5s 1952	a 93¾	89	95½
Mississippi River Power 5s 1951	96½	92	96½
New England Power 5s 1951	98½	97	100
Northern States Power 5s 1941	a 94	89½	94
6s 1941	a103½	101	104
Pacific Gas & Electric 5s 1942	a 94	90½	95
Pennsylvania Water & Power 5s 1940	99	96	99½
‡Philadelphia Electric 5s 1966	a 102½	97	105⅛
5½s 1947	a 103¾	99½	103½
6s 1941	106½	103½	106⅛
Portland Electric Power 6s 1947	94	89½	95½
Southern California Edison 5s 1939	98½	96	99
6s 1944	102½	100	103½
Cleveland Electric Illuminating 5s 1939	100	98½	100½
Detroit Edison 5s 1933	a100⅜	99⅜	101
6s 1940	a106	104	106½
Montana Power 5s 1943	a 98	95	98
New York Edison 6½s 1941	a113	109⅞	112⅝
Niagara Falls Power 6s 1950	105	104	105½
Ohio Power 7s 1951	106	103	106½
Tennessee Electric Power 6s 1947	97½	93⅜	98⅞
Texas Power & Light 5s 1937	94½	91⅛	95
Toledo Edison 7s 1941	a 108½	106	109
Utah Power & Light 5s 1944	a 91	87½	93⅛
Holding Companies			
Alabama Traction, Light & Power 5s 1962	80	65½	81
American Gas & Electric 6s 2014	95	94	95⅜
American Power & Light 6s 2016	94	91	94½
Amer. Water Works & Electric 5s 1934	a 93	84½	94
Commonwealth Power 6s 1947	a 96½	87	96½
Consolidated Cities Lt., Pwr. & Tr. 5s 1962	72½	64	73
Illinois Power & Light 6s 1953	99½	95	100½
United Light & Railways 5s 1932	93	87½	93
6s 1952	96	92	96
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing	99	90	99½
*National Carbon	122½	115	125
Worthington Pump & Machinery	a 78½	68	78½
COMMON STOCKS			
Allis-Chalmers Manufacturing	a 66	61½	66½
American Bosch Magneto—no par	27½	22½	38½
Electric Storage Battery—no par	a 58½	50½	64
General Electric	a 272½	193½	281
General Electric—10	a 11½	10½	11½
*Hurley Machine—no par	a 57½	48	59½
†Wagner Electric	25½	20	34½
Westinghouse Electric & Manufacturing—50	a 63½	55½	65
Worthington Pump & Machinery	a 27¼	23¼	31½
BONDS			
Canada General Electric 6s 1942	a 106½	102½	106½
General Electric 3½s 1942	a 83	80	83
5s 1952	a 104½	100	104½
Robbins & Myers 7s 1952	77	75½	91½
†Wagner Electric Manufacturing 7s	100½	97	100½
Western Electric 5s 1944	a 98½	96	98½
Westinghouse Electric & Mfg. 7s 1931	a 109	106½	109½

* Chicago Stock Exchange. † St. Louis Stock Exchange. ‡ Philadelphia Stock Exchange. || Boston Stock Exchange. § Baltimore Stock Exchange.
a Bid price Wednesday, Aug. 20.

Commission Rulings

Deferred Maintenance Charges.—In establishing rate schedules for the Eesley Light & Power Company the Michigan Public Utilities Commission made this ruling on the company's deferred maintenance charges: "Deferred maintenance charges which an electric utility is required to meet at irregular intervals by the nature of a joint ownership of water-power development should come partly out of the depreciation reserve accrued against the water-power property and should partly be separately accrued in a deferred maintenance account."

Commission Disapproves Discount for Prompt Payment.—No discount for prompt payment was provided in electric rate schedules approved by the Montana Public Service Commission for the Montana Power Company. The commission said: "It will be noted that there is no discount for prompt payment under the new tariff, this feature not proving satisfactory in practice, inasmuch as it has not appreciably encouraged prompt payment of bills with this company, thus reducing collection costs." The discount feature has, the commission added, been largely eliminated in tariffs of public service corporations serving the territory east of the Mississippi River and on the Pacific Coast.

Discrimination in Service Extensions.—Ordering the Union Bridge Electric Manufacturing Company to file rates for extension of its service in a certain direction outside town limits and then to furnish electricity to a complaining applicant, the Maryland Public Service Commission declared: (1) A public service company must serve all applicants within a reasonable distance from its lines indiscriminately. (2) A requirement that a public utility connect the premises of an applicant to its electric line without requiring the applicant to pay an amount equal to contributions by his neighbors, made for the purpose of securing the line extension into the neighborhood, would constitute discrimination. (3) An electric utility which has extended service beyond the limits of an incorporated town should file schedules of rates and rules covering service to the residents in the territory.

Newspaper Advertising by Utility Company Commended.—An unusual appeal was recently made to the Connecticut Public Utilities Commission by the Mayor of Stamford, who asked that the Stamford Gas & Electric Company's advertising costs should be disapproved on the ground that the cost of advertising should be used to reduce the cost of gas to the consumer. It was clearly shown by the company at the hearing that the amounts thus expended were relatively so small that no benefit would accrue to the consumer should the policy of advertising be abandoned. The commission, in approving the expenditure, remarked: "The experience and observation of this commission have been that frequently complaints by patrons in matters relating to utilities are due to the omission of the utility to provide intelligent information. This commission has always advocated a proper amount of publicity on the part of the utilities companies in order that their patrons may be informed, in a general way, as to operating and financial conditions as affecting the ratepayers. A fair and frank statement by the utility on controversial questions will assist in maintaining a relationship of good will and co-operation between the company and its patrons."

Recent Court Decisions

Company's Obligation to Maintain Motors for Pumping Not Established by Alleged Oral Agreement.—Carolus vs. Arkansas Light & Power Company was an action to recover because of the failure of the company, which had contracted to sell power to defandant for the irrigation of his rice fields, to keep an alleged oral agreement to install and maintain motors for this purpose as well as transmit energy. The plaintiff claimed heavy loss through inefficient maintenance, one motor set up burning out and causing the building containing it to be destroyed. The Supreme Court of Arkansas found that there was no proof of the oral contract alleged to exist and that the jury had been rightly instructed to return a verdict for the defendant company. (262 S.W. 330.)*

Franchise Rights in Florida.—Overruling an action brought by the state in *quo warranto* to declare invalid the franchises of the Pinellas County Power Company in the city of St. Petersburgh, Fla. (see ELECTRICAL WORLD, November 24, 1923, page 1087), the Supreme Court of Florida said: "The duly ordained and otherwise valid franchise of a corporation for a period of ninety-nine years to maintain and operate within the municipality granting such franchise an electric plant or lighting system for the purpose of furnishing electric lights and power to the city and its inhabitants will not be forfeited in *quo warranto* proceedings upon the ground that the grant is for an unreasonable or unlawful period of time, where it appears that the service rendered is subject to public regulation, that the corporate life of the grantee has not expired, and that the period of time during which the grant has run is less than the maximum term fixed by a subsequently enacted statute for such grants, and especially so where the municipality has stood by and acquiesced in the expenditure by the grantee corporation of large sums of money in the construction and extension of its plant and has so dealt with the grantee corporation as to estop itself at the time of the institution of the proceedings from asserting the illegality of the franchise upon this ground." (100 So. 504.)

Jury Empowered to Find Negligence Where Child Was Injured by Appliance on Exhibition in Showroom.—The Supreme Court of Colorado has sustained a verdict for the plaintiff in a case where an eighteen-month-old child was badly injured through inserting its fingers between the cogs of a washing machine on exhibition in the showroom of a central-station company's shop (Petty vs. Public Service Company of Colorado). The company claimed that it owed no duty to the child and that its injury arose from its mother's negligence in allowing it to leave her side, but the court held that a parent's negligence cannot be imputed to a child and that the jury was within its rights in finding the company negligent in allowing a machine to run with its cogwheels exposed and so placed as to be accessible to a young child. (226 Pa. 297.)

Property in Another State Cannot Be Made Subject of Rate Base.—In a suit brought by the City of Erie against the Pennsylvania Public Service Commission to annul gas rates fixed by that body, the Supreme Court of Pennsylvania ordered a revision of the commission's findings, laying down the principles that property in another state cannot be made the subject of a rate base, that present value is the standard rather than original cost, that valuation of lands for rate purposes was erroneous as not based on admissible evidence of market value, that the commission must determine the lands reasonably necessary to company's life, that a fair return on rate does not include repayment of capital outlay, that a utility is entitled to going value, that depreciation and going value should be shown in the commission's report, and that municipalities and consumers may appeal from the orders of the commission. (123 At. 471.)

Voluntary Payments in Excess of Authorized Rates Not Recoverable.—In an action brought by the Home Coal Company against the city of Macon, Kan., to recover alleged overcharges for electricity amounting to $4,201 the Kansas City Court of Appeals held that where a coal-mining company, in order to obtain an improved service, solicited defendant municipality to construct a power line to one of the company's mines and to enlarge the city's power plant at large expense and agreed to pay an additional charge in order to get the service, payment of such charge was not an involuntary payment and could not be recovered, although such payments were prohibited by law. Money paid for electricity as the result of overreading the meter was recoverable as paid under a mistake of fact, whether meter was read by consumer's or defendant's agents. Where electricity used for lights was incidental to power used, consumer was not required to pay a greater rate therefor than it paid for power. (262 S.W. 59).

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

To Make Best Use of Manufacturers' Agents

Their Real Function Is to Assist the Purchaser to Apply the Product—Economy Which Comes from Handling Related Lines of Equipment

By G. P. Edmonds
General Manager G & W Electric Specialties Company

PURCHASERS of equipment evidently do not understand, or else they forget, that manufacturers' agents or representatives are placed at various points in the field, not to add another profit to sales, but to render a service to customers. They are not selected merely to get business for the company or to take orders. They are appointed to study the problems of prospective buyers and show them how their company's products can be applied most effectively. If they do not render this service, the company which hires them gets no value and does not want them.

However careful manufacturers may be in their selection of representatives, it is usually impossible to ascertain in less than a year whether these men are functioning the way they should. If they merely telephone or call on customers, asking whether they want this, that or another piece of equipment, they are not performing the service that the manufacturers want them to. For they are expected to find out what engineering or operating problems face their prospective customers and help provide the solution by the use of their company's products. Failing in this, they are not only failing to stimulate the business they should, but are adding a cost to equipment which the purchaser must pay, but for which he is receiving no additional value.

Agents' Real Function

If purchasers of electrical equipment would only recognize this function of manufacturers' agents and call on them for full value in service, reporting their failure to render it to the manufacturer hiring them, the latter could avoid the lapse in time required to find out the fact himself. It is not only the reporting of agents who do not render service that manufacturers would appreciate, but the failure to give satisfactory service. Therefore, if the purchaser of equipment believes that a company has some equipment to meet his needs but finds that he cannot get satisfaction from an agent, he should promptly call on the manufacturer direct.

Manufacturers are always looking for men who have ability both in sales and engineering. They need men who know primarily how to take standard products and apply them to meet the problem in hand. The ability of such a man as a salesman is determined more by his success in showing the applicability of his product than by any high-powered sales talk on detail merits. Salesmen acting in this advisory capacity and fitting the product into the desires of the purchaser bring to the manufacturer an extensive knowledge of the best way to apply the particular product he is selling. It is this knowledge that manufacturers are paying their agents to disseminate. To obtain it purchasers must take these agents into their confidence by divulging the details of their problem.

Related Lines Help

It has been the experience of the writer that the manufacturer's agent who is best able to serve a purchaser, other qualifications being the same, is the one who handles related lines of equipment. For example, if he is agent for a manufacturer of line hardware, he can most advantageously handle also transformers, insulators and other line material. Or if he is agent for a motor manufacturer, he can also advantageously handle control apparatus, mechanical transmissions, etc. By so selecting the products he sells, and confining his visits to men with related interests, he is able to develop a specialized knowledge that he could not acquire if he handled unrelated products.

Furtermore, he can save the time of purchasers because if they do not want one product they may need another which he is handling. This, of course, saves them from the necessity of having to deal with several men.

Manufacturers take great pains in selecting agents. If purchasers will recognize the fact that they are expected to give advisory service and will co-operate with manufacturers in telling them when their agents fail to function as outlined, they will artist toward ridding themselves and the industry of parasites who do not

The Expense of Home-Made Equipment

Seldom Is the User of Electrical Products Justified in Incurring It—Unseen Elements in Its Cost

By the General Manager of a Manufacturing Company

USERS of electrical equipment who have been criticised by manufacturers directly or indirectly for making certain equipment themselves instead of buying it doubtless believe it to be only the wail of some one who sees his business reduced by such practice. If there were only this selfish reason, manufacturers could hardly hold any hope for its elimination, except perhaps that experience might show the wisdom of the ancient advice to the cobbler: "Stick to your last."

Fortunately for manufacturers, the practice of making home-made apparatus is not very extensive among utility companies. However, utilities or industrial plants which are doing so or are considering the idea may profitably pause to consider whether they are not making or about to make a mistake.

Upon superficial analysis it may be concluded by users that manufacturers are making an enormous profit on some products. Perhaps some manufacturers are charging larger prices than seem reasonable, but where this is suspected it will usually be found that a small demand requires that the production and sales expense be spread over a few sales, thereby producing high unit prices. It is believed that by exercising a little imagination re-

garding the possible uses for small-demand products, by more vigorous sales efforts and by a little more faith in what the future will bring in the way of remuneration, some manufacturers could avoid this criticism by spreading their development expense over a longer period.

UNSEEN COSTS

Forgetting the small-demand products on which there has been a larger development expense, there are still the so-called standard products which some users believe they can make cheaper than they can buy. There would not be much to be argued if the user had the same background of experience with what can and cannot be done in manufacturing processes that the manufacturer has, if he had machinery, labor and an engineering force that could be used consistently and continually on this work, if he had the same facilities for buying raw materials, and could conduct the work on a large-production scale. These conditions seldom exist.

Generally, a user who makes some electrical product himself has to devote time of his engineering staff to designing the product that could be spent more advantageously otherwise. Special machinery with which no experience has been had before has to be purchased. Materials must be bought in relatively small quantities, and possibly some prove unsuitable later. Men have to be trained to the manufacturing processes and they have to be supervised. Space and equipment are utilized in which there is an investment that could be more profitably employed if applied to the user's own business. Then there is the accounting for expenses, which puts an additional load on the accounting department so that it cannot devote time to its regular duties, or more clerks must be hired. If accounting is not done, how can any one know his actual expenses?

Briefly, expenses are incurred which do not show in materials or direct labor. The overhead charges are omitted, but they nevertheless exist and are merely charged to the regular business of the company.

WHERE JUSTIFIED

Utilities and industrial plants should find in their own arguments for acquiring business the answer to whether it is wise to make products which they can buy. For example, in the utility business what is it that makes it difficult sometimes to convert an isolated plant to central-station service? It is that the isolated plant does not charge all overhead expenses to the operation of that plant. Likewise, in making home-made products, who would ever admit that shoes could be made cheaper by the user? The same argument applies to the making of electrical equipment by other than a manufacturer of the product.

Home-made equipment is only justified under two sets of circumstances—(1) in an emergency when manufactured equipment cannot be obtained quickly enough, although even then an investment in spare parts would save considerable expense if properly accounted for; (2) when equipment having the desired qualifications is not available on the market.

Usually, if the extent of usefulness of a special product is explained to a manufacturer who has any foresight whatever, he will be glad to develop a new product, and the user will not have to pay the whole development expense as he would if he made it himself. In the development of such products manufacturers will always have to depend to a certain extent on users. Too often, however, a user demands a totally new product when all of his requirements could be met by assembly of slightly modified standard products. By consulting with a manufacturer he will be able to ascertain if this can be done.

In conclusion, it can be said that if a user will only be just as accurate in cost accounting as he expects a customer of his to be when arguing the price of his service or product, he will never go into the manufacture of his own equipment except under the two circumstances mentioned, and possibly not then.

Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

ENCOURAGING reports of a gradually increasing volume of steady business continue to come in from most sections of the country. Buying by industrials has noticeably improved, and orders are being placed for material which was originally quoted on several months ago. The very good improvement in sales noted by wire manufacturers following recent price increases is said not to be keeping up, it having been apparently a rush of buyers to cover their requirements in fear of further advances—an indication, based on the amount of business so closed, that they forsee strong possibilities of an increasingly active market for their goods.

Added to these factors is the continued activity of the stock market, with the advancing prices of industrial stocks. These things all bear out the belief, confidently and generally expressed, that the present improvement, coming as it does in a period when normally there is no active buying, must continue and become even more marked.

An increasing demand for supplies has encouraged New England jobbers. Better conditions are apparent in the industrial field in this district, central-station business is growing steadily, much telephone construction is under way, and a good movement of small used motors is reported. In the New York district the improvement in industrial buying is noted by an increase of orders as well as inquiries. Jobbers' business in this territory was quiet, but there are many indications of a definitely progressive increase in sales. Good retail business is being enjoyed in the Southeast, and many orders are being placed by central-station and municipal plants in southern Florida. In the middle West the volume of business is gradually increasing and is satisfactory. A considerable portion of the building on the Pacific Coast is being delayed in the expectation of lower prices, but the electrical industry believes higher prices to be more likely.

New Merchandising Policy Needed for Washing Machines

MANUFACTURERS of washing and ironing machines report business varying from good to spotty and slow. The general opinion, however, is that sales are a little below normal and orders are much harder to get, but collections are very prompt and good. Taking the whole period covering the first six months of the year various companies say that the business then transacted was very good indeed, but with sales slowing up now, stocks are accumulating and there has been a reduction in the hours per week at factories. One company finds that there is a greater demand for instalment buying than ever before and believes, from extensive experience, that, contrary to the opinion of some of the merchandise managers, the easier the terms made on an electric washer the less are the losses.

Manufacturers feel that the future business of washing and ironing machines is brighter and more comprehensive than it has ever been before, particularly when it is fully realized

that the washing machine is not a specialty but a product that should and can be merchandised strictly in accordance with those fundamentals which are at the bottom of all good distributing activities. It is further felt that there is entirely too much of the hit-or-miss, "put-it-over" tactics in the washing machine industry. A sound merchandising policy that will be fair to all is needed for the higher development of the business.

As far as the ironing machine is concerned, there appears to be a trend toward the use of the small-type machine in the apartment or kitchen of the home. This seeming trend is brought about by a class of purchasers now entering into the market who formerly were unable to purchase the larger or wider machine, which remains the mainstay of the ironing machine industry in homes where the laundry or kitchen is large enough for its proper placement.

During the past five years many new manufacturers have entered the washing machine field, and in order to introduce their merchandise they have kept their selling price altogether too low. This condition has handicapped the industry and caused the failure of some of these manufacturers. In an effort to regain some of the large amount of money lost they have liquidated finished and unfinished products at sacrifice prices.

Deliveries are very prompt as plenty of stock is available in most cases. Prices will probably remain stationary, with conditions more favorable to an advance than a drop. There has been a slight increase in material cost, but it has not yet been sufficient to reflect itself in the retail price. Some companies early in the year made slight increases to take care of added refinements in construction.

Delinquent Electrical Accounts Increasing

THREE of the five divisions reporting to the National Electrical Credit Association show an increase in delinquent accounts for July, 1924, over June. At the same time the average amount also increased. Compared with July, 1923, there were also three divisions having a higher number of accounts delinquent and a higher total amount. Conditions remain practically unchanged in the central division, since a decrease of only four accounts was reported for July over June, 1924. In New York, Philadelphia and the New England territories the total amounts are rising. In New England the average amount for this period increased from $79.78 to $95.40. Conditions on the Pacific Coast are good, with a reduction of the average amount in June of $176.25 to $32.42 for July, 1924.

DELINQUENT ACCOUNTS IN JULY

Branch and Month	Number of Accounts Reported	Total Amount	Average Amount
Central Division:			
June, 1923	721	$95,133.51	$131.95
June, 1924	889	108,723.48	122.30
July, 1923	724	91,394.71	126.23
July, 1924	885	107,773.30	121.77
New York:			
June, 1923	428	50,758.00	118.00
June, 1924	336	49,433.00	147.00
July, 1923	404	61,434.00	152.00
July, 1924	356	60,164.00	170.00
Philadelphia:			
June, 1923	227	24,580.53	108.28
June, 1924	248	28,063.46	113.16
July, 1923	238	20,651.30	86.77
July, 1924	270	30,596.62	113.32
New England:			
June, 1923	29	2,325.95	80.20
June, 1924	88	7,021.00	79.78
July, 1923	26	3,062.32	117.78
July, 1924	112	10,683.63	95.40
Pacific Coast:			
June, 1923	52	13,873.41	266.80
June, 1924	22	3,877.39	176.25
July, 1923	36	7,992.57	222.01
July, 1924	19	616.00	32.42

Pole Prices Also Reduced by Other Companies

FOLLOWING an announcement in the ELECTRICAL WORLD last week that three companies had made substantial reductions in the price of their complete line of Western red and Northern white cedar poles varying from 10 per cent to 20 per cent, other companies also made similar announcements. Included among these are Lindsley Brothers, Minneapolis.

Copper Hesitates, but Lead, Zinc and Tin Continue to Advance

THE non-ferrous metals have generally shown an advance in price over last week, with lead in the strongest position, although the market has not been so active early this week. Zinc and tin have increased slightly in price. The copper demand has fallen off, and speculative offerings have depressed prices somewhat, though the producers have too many orders ahead to meet competition at present. Producers generally have been asking 13⅞ cents for copper, and some was sold at that price on Wednesday. In some cases others could not get even 13⅝ cents, and at least one seller has large quantities for August-September shipment at 13¼ cents, substantial tonnages having been sold at that figure.

NEW YORK METAL MARKET PRICES

	Aug. 13, 1924 Cents per Pound	Aug. 20, 1924 Cents per Pound
Copper, electrolytic	13⅛	13¼–13⅛
Lead, Am. S. & R. price	7¼	8
Antimony	8⅛	10⅛
Nickel, ingot	27	27
Zinc, spot	6.175	6.60
Tin, Straits	52	52⅛
Aluminum, 98 to 99 per cent	28	28

The official contract price of the American Smelting & Refining Company for lead was advanced to 8 cents on Friday, August 15. Other sellers promptly pushed their quotations still further upward, and consumers have been compelled to pay as high as 8¼ cents for small tonnages that were immediately required. Producers feel that the price will advance further and are not particularly anxious to sell.

Substantial orders for zinc have been placed recently by galvanizers, and prices have advanced moderately, to 6¼ cents Wednesday, but not much business was done at that level.

American consumers seem to be buying only sufficient tin for immediate requirements, although the price is increasing. The 99 per cent grade is expected to be in short supply here as Chinese shipments are being held up.

Improvement in Industrial Buying Persists in New York District

INDUSTRIAL buying in the New York district is reported by several manufacturers as improving. A manufacturer of equipment selling almost entirely to industrials says that orders as well as inquiries are increasing and that business is on the up grade. So far in August 25 per cent more business has been transacted by this company than in July or June, during which months sales were about even. Another company reports that orders are now being placed for industrial apparatus original quotations on which were made as far back as last February, and it has noticed a decided pick-up in industrial buying.

Jobbers' business in general was quiet, although in one case the sales made last week were reported as being larger than at any time in the last seven weeks. However, confidence prevails that the next month will show a good improvement. Many indications point to this. For instance, much building is in progress which is not yet ready for electrical materials; the industrials are entering the market more actively; the railroads, which have been particularly cautious buyers, are expected to place more orders, and along with all this the general merchandise line should improve as August is always a comparatively slow month.

Opinions of distributors differ as to the effect on the market of the recent reduction in the price of poles. While some state that business has been stimulated others say that hesitation in buying is still evident, but it must be remembered that this is not an active buying period, and it is very hard to say how much of present business is due to the price reduction. However, it is generally stated that the low prices have not yet resulted in any great unloading of stocks, but a later reaction may result in this. Some improvement has been noted in cross-arm sales and there are rumors of a price advance on pole-line hardware due to the upward trend of the steel market.

Business in New England Showing Some Improvement

INCREASING demand for electrical supplies has encouraged New England jobbers during the past week to look for an earlier revival of fall business than is seasonably normal. The market is steady rather than spectacular, with ample room for improvement industrially, although better conditions are here and there apparent in the textile field and labor conditions are decidedly improved in the leather industry.

Sales of commercial lighting fixtures are more active in response to recent state regulations, and the movement of small used motors is vigorous. Socket appliances are doing well in lower-cost units, and hundreds of prospective purchasers' names and orders were obtained at the Hampton Beach electric show closing last Monday and drawing over 30,000 visitors from many Eastern localities. Central-station business is growing steadily, the Boston Edison company showing a gain of

20.9 per cent in net revenues after taxes for the first half of the year. A 10 per cent extra dividend at Worcester, Mass., has been declared and many other companies are prospering, with a resulting heavy volume of purchases of meters, lamps and line material. Many millions are being expended in telephone construction in New England this year, and house wiring is very active. Prices, in the main, are steady.

Trade in the Middle West on a Gradual Up Grade

THE volume of business being transacted in the Chicago and Middle Western territory is increasing. While it is gradual, it still is noticeable and satisfactory. Industrial apparatus, demand motors, etc., are still a little off, but the call for central-station distribution equipment has accelerated. Jobbers report that considerable business was transacted in code wire and conduit. A larger number of inquiries were received than during the weeks previous. One central station and a jobber started an extensive campaign throughout northern and central Illinois on ventilating equipment. Quite a large volume of sales resulted.

Prices remain stationary. Copper advanced again, but the increase is not expected to affect code wire immediately. The decrease in pole prices apparently has stimulated a better interest in this commodity. Appliance sales have increased considerably, various orders for larger quantities of appliances being placed, and September business is expected to be very good. The principal appliances purchased were heaters and cool morning necessities. Building activity has fallen off a trifle.

Good Retail Business in Southeast —Crops in Very Good Shape

ESTIMATES, based upon the figures of the United States Department of Agriculture, indicate that the value of 1924 crops in Georgia will exceed those of last year by $100,000,000 and that this state will jump from eighteenth to fourth or fifth position in agricultural standing among the United States. If weather conditions permit these estimates to be reached, Georgia farmers will be in better shape than for many years. Southern Florida is also in fine shape, and the central-station and municipal plant expansion activities are calling for very satisfactory amounts of all types of line-construction materials. The demand for "white-way" posts and fittings from this section is also reported good. There is some improvement over a year ago to be noted in the phosphate mining industry in Florida, but its condition is still unsatisfactory.

Vacuum cleaners have been slow for a few months past, but the demand is picking up, each month showing an increased business over the preceding month, and the outlook for fall is very bright. Atlanta retail electrical business in all lines is good, with flatirons and small socket appliances going well all over the Southeast. Fans have had an excellent season, and it is evident that there will be no carry-over.

Much Building on the Pacific Coast Is Being Delayed

IT IS reported that a considerable amount of work on the Pacific Coast covered by recent building permits is being delayed in expectation of lower prices. On the other hand, with copper, steel and cotton trending upward, the electrical industry is expecting higher prices. Decreased sales over a six-month period of hand-to-mouth buying have resulted in much constructive sales work in such staples as cables, cords and electrical household hardware and such specialties as water and air heaters. It has been announced that a new porcelain insulator factory will shortly be erected in the San Francisco Bay district.

Sales of insulating material such as fiber and mica show some improvement, but the actual net increase has been lowered by the fact that certain large local users have been able to cut their purchases by adopting new processes of manufacture. Insulating-tape orders have been especially good, and it has been found necessary to create a 1,000-lb. price, replacing the former 100-lb. maximum. Lamp-cord sales are decreasing, probably due to new fixture fashions, but this falling off is somewhat recompensed by sales to manufacturers of art and novelty portables. The recent radio exposition held in San Francisco has been remarkably well attended and was successful in every way. The better-illumination campaign has been retarded by the necessity for load curtailment, but much sales stress is being laid upon reflector refinements in an attempt to rescue the lighting-unit business from a purely price basis.

Scientific handling of several big buildings recently completed has helped restore the tone of the market. The California State Association of Dealers and Contractors has arranged a program for its September convention which is practical and constructive.

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Formica Insulation Company Again Expands

New buildings which add 27,000 sq.ft. of floor space have just been completed by the Formica Insulation Company, Cincinnati, on its present property. In addition, a building providing 33,000 sq.ft. of floor space has been purchased, making a total of 100,000 sq.ft. devoted to the production of "Formica." The radio demand for this product has been a very large factor in the expansion.

Beardslee Chandelier Company Opens New Showroom

For a better presentation of its lighting fixtures, the Beardslee Chandelier Manufacturing Company, 216 South Jefferson Street, Chicago, is utilizing about 2,200 sq.ft. of its factory floor space for three elaborate display rooms. Specially designed rooms have been built on the first floor to display three periods of fixture design—Georgian, Italian and English. In the main general display room three bays provide room for different hangings needed for the various types of illumination distribution. To permit flexibility in changing fixtures all outlets consist of "Elexits."

Westinghouse Receives Orders for Transformers and Switchgear

A contract for power transformers and switchgear amounting to approximately $630,000 has been awarded to the Westinghouse Electric & Manufacturing Company by the Columbia Power Company, Cincinnati.

The Westinghouse company has also received an order from the Brooklyn Edison Company for eighty-eight automatic induction feeder regulators and switching equipment of the truck type, the circuit breakers on which are supplied with periodic reclosing equipment. The regulators supplied have their primary relays and compensators with control switches mounted inside of cabinets bolted to the regulators, thereby making a self-contained unit.

Trade Commission Makes Charge Against Landers, Frary & Clark

The Federal Trade Commission has issued a complaint against Landers, Frary & Clark, New Britain, Conn., for maintaining and enforcing a merchandise system of fixing specified uniform prices for their product in co-operation with wholesale and retail dealers. Charles F. Smith, chairman of the board, Landers, Frary & Clark, said to a representative of the ELECTRICAL WORLD that the hearing is set for September 24, at which time he is confident that the answer of the company to the charge will be satisfactory to the government and will absolve his company from anything in the nature of a violation of the Sherman law.

Jones-Beach & Company Buy New Building

Jones-Beach & Company, Philadelphia, jobbers, have just purchased a new, modern concrete building containing 30,000 sq.ft. of floor space at the northeast corner of Seventh and Wood Streets. Property adjacent to this building has also been purchased to provide for future expansion. The company announces that the sales force and office staff have been increased and a few important lines added. A larger stock will be carried than heretofore to put the company in a position to give still better service.

Belden Manufacturing Moves Eastern Warehouse

The Belden Manufacturing Company, Chicago, manufacturer of insulated wire, cable and cordage, announces that its Eastern sales office and warehouse was moved on August 9 from Metuchen, N. J., to 399 Market Street, Newark, N. J., one block from the Pennsylvania Railroad station. In this warehouse greatly increased and more varied stocks of magnet wire, rubber-covered wire and insulation material will be carried to meet the requirements of the Eastern trade. S. C. Schenck continues in charge.

The company also announces that L. G. Le Bourveau has been appointed Southeastern representative, with headquarters at 708 West Twenty-ninth Street, Jacksonville, Fla. His territory consists of Florida, Georgia, North and South Carolina, Alabama, Mississippi and Tennessee (with the exception of Memphis).

General Electric Installs 6-Ton Electric Furnace

A 6-ton horizontal, ring-type, induction steel-melting furnace, the largest of its kind in the country, has recently been placed in successful operation by the General Electric Company at the plant of the Allegheny Steel Company, Brackenridge, Pa. The furnace is rated 800 kw. at 2,200 volts, single-phase, 8.5 cycles, the power supplied being converted by a motor-generator set. Conventional motor-driven tilting mechanism of the rocker type is provided, and a motor-driven blower is used to supply cooling air to the furnace winding.

The average time necessary for melting, refining and alloying a charge of 7,000 lb. of steel scrap is four hours, with a total over-all energy consumption of about 800 kw.-hr. per ton. One of the desirable features claimed for this unit is a high-grade product of extreme uniformity, resulting from the ease of metallurgical control and the cleansing and stirring action caused by the electromagnetic forces in the metal bath.

Sanford Riley Stoker Consolidates with United Machine

The Sanford Riley Stoker Company, Worcester, Mass., has taken over the entire business of the United Machine & Manufacturing Company, Canton, Ohio, manufacturer of Harrington stokers. The business of the United company will henceforth be handled in the name of the Sanford Riley Stoker Company. The head office of the company will remain at Worcester, with plants at Worcester, Detroit, and Canton.

This consolidation makes available to the stoker-buying trade the combined engineering and manufacturing talent of the two companies, and it will now be possible for the Sanford Riley company to offer a type of stoker suitable for every possible combustion need, these being the Riley, Jones, Murphy and Harrington stokers. Mosher separators, heretofore made by the United company, will be manufactured and sold by the A. W. Cash Company, Decatur, Ill., manufacturer of boiler specialties and combustion control. The Cash company is a subsidiary of the Sanford Riley company.

Toledo Cooker Company Announces Change of Name

The name of the Toledo Cooker Company, Toledo, Ohio, manufacturer of appliances for the home since 1884, has been changed to the Swartzbaugh Manufacturing Company. The company announces that this change was made necessary because of the variety of products now being made. The original line consisted chiefly of steam and fireless cookers, but at the present time electric appliances, line-construction equipment and food conveyors are also manufactured.

Under the trade name "Everhot" a complete line of lamp socket appliances is being developed, some of which are already on the market. No change has been made in the executive personnel. C. E. Swartzbaugh, Jr., remains president, C. K. Swartzbaugh, vice-president, J. B. Swartzbaugh, treasurer, and J. H. MacFarland, secretary.

General Devices Company Moves to Grand Rapids

The General Devices & Fittings Company, manufacturer of high-tension equipment, has moved its plant from Chicago to Grand Rapids, having purchased the factory of the Couple Gear Freight Wheel Company of that city. According to J. M. Van Splunter, secretary, this new plant has a floor space capacity of 25,000 sq.ft., covering 7 acres of land.

The General Devices Company will supply parts for Couple Gear electric trucks now in service, although at present it does not contemplate building trucks but will specialize in its regular lines of high-tension equipment. No change has been made in the executive personnel of the company.

J. C. Bowman, advertising manager Packard Electric Company, Warren, Ohio, announces that after September 1 he will establish his own advertising agency in Cleveland. Headquarters have not yet been selected, but for the present mail can be addressed to the Packard Electric Company, which has contracted with Mr. Bowman to direct its advertising for the next five years.

The Robert Bosch Magneto Company, Inc., manufacturer of Bosch magnetos, "Longlife" spark plugs and two-tone horns, has appointed Henry M. Cunnington, formerly trade and markets editor of the ELECTRICAL WORLD, to take charge of publication advertising and sales promotion literature. Mr. Cunnington has been connected with the sales promotion department of the Robert Bosch organization since May of this year. The company's executive offices were recently enlarged by 100 per cent, when the entire eleventh floor of the building at 123 West Sixty-fourth Street, New York City, was taken over.

The International A. E. G. Electrical Company has just been founded at Amsterdam by the Allgemeine Elektricitäts-Gesellschaft of Berlin and the Amsterdam Bank, according to a report to the Department of Commerce from the American Commercial Attaché's office, the Hague. The capital amounts to 10,000,000 guilders, half of which has been paid in to date. The new institution is to manufacture and deal in electrical installations, machines, apparatus and instruments.

The Williams Gauge Company, Pittsburgh, manufacturer of steam columns, gages and steam specialties for large work, has awarded the Austin Company, Cleveland, a contract for the design and construction of a machine shop and office building, 60 ft. x 120 ft. Completion of this building, an Austin No. 1 standard, is guaranteed in fifty-five working days. The Cleveland headquarters of the Austin company will make all purchases and handle the construction.

The Triangle Conduit Company, Inc., announces that since August 15 its general office and factory, including the new rubber-covered-wire mill, has been at Dry Harbor Road & Cooper Avenue, Brooklyn, N. Y.

Vickers, Ltd., England, has received an order from the Ontario Hydro-Electric Power Commission for two 12,000-hp. water turbines to operate at a head of 72 ft. The power will be used for industrial purposes in and about Fort William and Port Arthur, on the north shore of Lake Superior.

The General Electric Company has issued a booklet consisting chiefly of a series of illustrations showing the various activities of the company and containing a brief description of its entry into the electrical industry.

The Buffalo Forge Company, 490 Broadway, Buffalo, is now equipping its variable-speed electric blowers, for blowing forge fires, small furnaces, organs, etc., with a specially designed "Buffalo" - Cutler - Hammer regulator which is fully inclosed. The motor supplied can operate satisfactorily on either direct or single-phase alternating current, 25, 40 or 60 cycles.

Clayton Mark & Company, 111 West Washington Street, Chicago, manufacturers of wrought pipe and conduit, have awarded a contract for the design and construction of their new galvanizing plant to the Austin Company, Chicago. The new plant is to be at Seventy-fourth and Robey Streets and will cost approximately $30,000. The building will be 90 ft. x 120 ft., with corrugated siding and roof. Construction and purchase of all materials will he handled through the Chicago office of the Austin Company.

The Thomson Electric Welding Company, Cincinnati, has tentative plans under consideration for the establishment of a plant at Lynn, Mass., where experimental works are now being operated on Pleasant Street. The new factory will replace the present Cincinnati works, which are to be removed to this location, with additional equipment installed for increased production. The company is said to be considering the acquisition of the local plant of the Campbell Electric Company on Stuart Street.

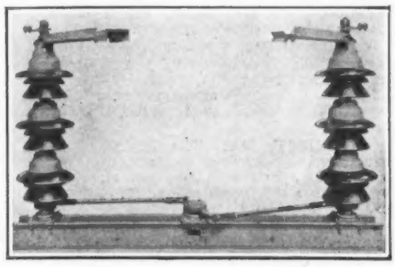
New Equipment Available

Short Descriptions of New Apparatus and Accessory Equipment of Interest to the Electrical Industry and Available from Manufacturers and Announcements of New Lines

Pole-Top Switch

A 135,000-volt, 600-amp. pole-top switch of simple construction, known as "type PM-Form 2," has been developed by the Delta-Star Electric Company, Chicago. For multi-pole service two or more elements are interlocked and may be operated either manually or by motor.

The switch consists of two rotating pillars with copper blades reinforced by heavy T-iron. On one blade the copper contact extends beyond the T-iron and is covered by a sleet shield, the other blade having a self-aligning contact, the two halves of which are held together by contact springs, no sleet protection being necessary for this part. The two blades rotate in the same direction simultaneously, the insulator pillars being actuated by levers controlled from the third bearing mounted in the center of the switch base. The line wire connects to lugs fastened to a small and easily rotated bearing. All bearings are fitted for use with the Alemite high-pressure lubricating system.



135,000-VOLT POLE-TOP SWITCH

Portable Flight Conveyor

A portable flight conveyor, made entirely of steel, for handling soft coal and other material having a large percentage of lamps, and also designed for the handling of anthracite coal, has been developed by the Gifford-Wood Company, Hudson, N. Y. The conveyor is fitted for pressure lubrication throughout. A powerfully geared lifting mechanism is provided to regulate the slope of the machine and the height of discharge. The belt consists of a series of steel flights of channel formation riveted to endless strands of pintle chain and forms a trough 20 in. wide. The motor is totally inclosed and is built into the conveyor. The capacity is 1 ton per minute.

Oil Circuit Breaker

A new line of high-tension oil circuit breakers, known as the FO-40 breakers, of all steel construction and providing exceptional mechanical strength, has been developed by the Condit Electrical Manufacturing Company, South Boston, Mass. They are manufactured for 37,000 volts, 50,000 volts and 73,000 volts and 400 amp., 600 amp. and 800 amp., with interrupting capacity ratings up to 1,000,000 kva. A high factor of safety is provided in the insulation, and the electrical contacts and mechanism are designed to obtain a high speed of break. The usual forms of operation are available, and in addition Conduit automatic reclosing mechanism for operating on alternating current or direct current service is adaptable to these breakers.

Transformer-Oil Filter Press

An improvement recently made in the General Electric oil filter press is the addition of an air bell for testing suction piping so as to avoid mixing air freely with the transformer oil as it is being purified. The air bell is so arranged that it can be pumped up to the shut-off pressure of the filter press pump. After the suction pipe valve is closed at the transformer drain the pump is stopped and the stored air pressure is automatically released against the oil in the suction piping. Leaks will generally be shown immediately by oil coming through, so they can be readily located and corrected. Air bells are available as supply material for equipping existing filter presses.

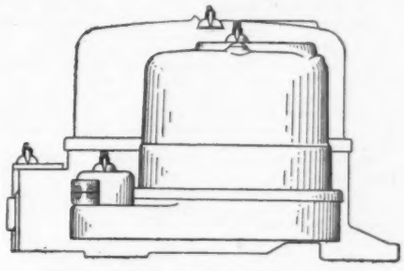
Watt-Hour Meter

A watt-hour meter, known as the type OB, new in size and form, but retaining the fundamental characteristics of former Westinghouse meters, has been developed by the Westinghouse Electric & Manufacturing Company.

NEW WESTINGHOUSE WATT-HOUR METER TYPE "OB"

The new "OB" meter weighs only 4 lb. as compared with the "OA" meter, which weighs 9½ lb. A large percentage of the reduction in weight is due to the use of drawn-steel parts in place of the cast-iron base and frame of the "OA" meter. A comparison of the relative sizes of the new and old meter is shown in the illustration.

The performance of the new meter, both mechanical and electrical, is somewhat better than that of the "OA" type. The load curve particularly is better on the overload portion than the corresponding curve of the "OA" meter, and the shunt loss is approximately 1 watt, slightly less than that of the former meters. Although the size of the meter has been reduced, the arrangement of the dial circles, as can be seen, gives a register with larger figures and dial circles. The register has two other important features in the rigid box construction of the sub-gear train and in the bayonet mounting from the rear of the box frame.



SIZE COMPARISON OF "OA" AND "OB" METERS

The new meter using drawn-steel parts for the frame and case produces a small light-weight meter which is said to have not only the accuracy of performance and the high quality of previous meters, but complete interchangeability of parts, ease of assembly, testing, inspection and repairing to a degree unobtainable in former designs.

Arc-Welding Generator

A 120-cycle arc-welding generator suitable for any power installation has been placed on the market by the Allan Manufacturing & Welding Company, Inc., 726 Washington Street, Buffalo, in conjunction with its line of welding transformers. The armature is built up on a large-diameter shaft and is carried on two ball bearings, while an extension of the shaft carries the exciter armature, the frame of which is cast integral with one end bell. The exciter is eliminated where direct-current is available.

The 4-kw. size has a range of 50 amp. to 200 amp. continuous output, with an unlimited number of steps between the given limits. With this new generator great ease of operation is obtained. The arc is easy to start and maintain, and the apparatus is designed for smooth and rapid deposition of metal with the necessary penetration. This new welding generator also embodies the "L.C. semi-arc" feature for use in connection with the welding of light cast-iron sections.

New Trade Literature

SAFETY CLUTCHES AND BRAKES.—The Cutler-Hammer Manufacturing Company, Milwaukee, is distributing a booklet, known as publication No. 3,127, describing the "C-H" magnetic safety clutches and brakes. Particular reference is made to the use of the "C-H" clutch-brakes in rubber mills where they are used to secure quick stoppage of mixing and cracking rolls, washers and calendars when accidents occur. These clutch-brakes, however, are adapted for use on any rotating machinery that must be stopped instantly.

INDEX.—The General Electric Company, Schenectady, N. Y., has issued an index to its descriptive publications, dated July, 1924.

ELECTRICAL SUPPLIES.—The Virginian Electric, Inc., Michigan Avenue and New York Central Railway, Charleston, W. Va., is distributing catalog No. 24, containing 344 pages, covering electrical merchandise and equipment which it distributes. The company has aimed to make it a complete and up-to-date reference book of standard electrical supplies, illustrating and describing material for which there is a daily demand.

ELECTRICAL APPARATUS.—W. R. Ostrander & Company, 371 Broadway, New York City, are distributing a catalog describing their electrical apparatus and special devices.

SWITCH.—The Monitor Controller Company, Baltimore, has issued bulletin No. 105, covering the Monitor "Triplock" switch, which was designed for use in remote control of lighting circuits and electrical apparatus.

SYNCHRONOUS MOTORS.—Bulletin No. 854 issued by the Electric Machinery Manufacturing Company, Minneapolis, describes its synchronous motors for compressors. Several illustrations are given showing the installation of the motors in various industrial plants and pumping stations. The company is distributing bulletin No. 785, which gives a list of some of the users of "E-M" synchronous motors and vertical alternators.

INSULATORS.—A new catalog has been issued by the R. Thomas & Sons Company, East Liverpool, Ohio, covering its products. In addition to the usual illustrations with dimensions, weight, etc., the catalog contains a discussion preceding each section devoted to the various types of insulators, tubes and bushings, fittings, cross-arms, etc., and also testing data. Valuable information relative to the design, construction and maintenance of transmission lines is also given.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

Purchase is desired in Montevideo, Uruguay (No. 11,262), for 37,750 iron supports for overhead transmission lines.

An agency is desired in Zurich, Switzerland (No. 11,274), for modern household appliances.

Purchase and agency is desired in Alexandria, Egypt (No. 11,273), for phonographs, telegraphones, sound boxes, motors and parts.

Purchase and agency is desired in Bradford, England (No. 11,266), for household refrigerating plants.

ELECTRICALLY OPERATED PUMPING PLANTS FOR CHRISTCHURCH, NEW ZEALAND.—Tenders will be received by the City Council of Christchurch, New Zealand, until Oct. 21 for electrically operated pumping plants.

SPILLWAY REGULATING GATES FOR WAIKATO (NEW ZEALAND) POWER SCHEME.—Tenders will be received by the Public Works Department, Wellington, New Zealand, until Sept. 23 for spillway regulating gates (section 52) for the Waikato power scheme.

SWITCHGEAR AND OIL SWITCHES FOR LAKE COLERIDGE POWER SCHEME.—Tenders will be received by the Public Works Department, Wellington, New Zealand, until Oct. 28 for switchgear, (section 158) and 6,600-volt oil switches (section 160) for the Lake Coleridge (New Zealand) power scheme.

ELECTRIFICATION OF URUGUAYAN RAILWAY PROPOSED.—The proposal for the electrification of the Northern Tramway Company, *Commerce Reports* states, has been approved by the National Administrative Council of Uruguay. In order to provide funds the executive is authorized to issue and sell debentures not to exceed 5,500,000 pesos (approximately $4,290,000 at current rate of exchange).

DUPLICATION OF THE MORWELL (AUSTRALIA) POWER SCHEME PROPOSED.—Application has been made to Parliament by the State Electricity Commission of Victoria, Melbourne, Australia, for authority to duplicate the Morwell power station. The station has recently been started and supplies electricity to industrial plants in Melbourne.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

AUGUSTA, ME.—The Central Maine Power Company is disposing of a bond issue of $1,550,000, part of the proceeds to be used for extensions and improvements.

BURLINGTON, VT.—Improvements contemplated by the Burlington Electric Light Department include the installation of fifty-six ornamental lamp standards, mounted with 400-cp. lamps, 15,000 ft. of fiber conduit, underground construction, and the removal of all poles (ornamental excepted) and overhead wires on approximately 5,200 ft. of streets in the business section, for which conduits have been installed. M. G. Clark is superintendent.

BARTON, VT.—Plans are being prepared by the Electric Department for the construction of a new penstock, about 800 ft. long and 6 to 7 ft. in diameter. Material will be purchased during the coming winter and the penstock will be put in place next summer. F. W. Cutting is trustee.

WOODSTOCK, VT.—The Woodstock Electric Company contemplates the erection of a 44,000-volt transmission line to Windsor and the erection of a 750-kva. substation, 44,000/2,300 volts. Wilfred Smith is manager.

BOSTON, MASS.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Sept. 2, for battery charging switchboard and spare parts, for the Fore River navy yard (Schedule 2547).

Middle Atlantic States

ALBANY, N. Y.—The Department of Public Works contemplates the installation of ornamental lamps on Lake Avenue next year after this section has been paved.

ARGYLE, N. Y.—The Adirondack Power & Light Company has been granted permission to extend its transmission lines in the town of Argyle to exercise a franchise granted by the Town Board.

CATSKILL, N. Y.—The Upper Hudson Electric & Railroad Company has asked for authority to build distribution systems in the towns of Durham and Greenville and for approval of franchises granted by the town boards.

DUNDEE, N. Y.—E. L. Bailey, owner of the local electric plant, has leased his franchises and systems in this village and in the towns of Milo and Starkey, and also Reading, which is yet to be approved by the Public Service Commission, to the New York Central Electric Corporation. The company, it is understood, plans to build a 3,000-hp. hydro-electric plant at the outlet of Keuka Lake and also to erect a high-tension transmission line from the Penn Yan power plant to Dundee and on south to Corning.

JAMESTOWN, N. Y.—The Board of Public Utilities has rejected all bids submitted Aug. 14 for air-cooling equipment for a 2,000-kw. turbo-generator at the Steele Street lighting plant. New bids will be received until Aug. 28.

JEFFERSON, N. Y.—Preparations, it is reported, are being made by the New York State Gas & Electric Corporation, Ithaca, for extending its service to Jefferson.

LAKEVILLE, N. Y.—Plans for the new salt-mining plant to be erected in Lakeville by the Lakeville Salt Company, Inc., at a cost of about $200,000, include a power house.

MOUNT MORRIS, N. Y.—Extensions and improvements are contemplated by the Mount Morris Illuminating Company, including the construction of a transformer station. The erection of a high-tension transmission line from Retsof to Cuylerville is under consideration.

PERRY, N. Y.—The New York Central Electric Corporation has applied for permission to acquire the properties of the Distributors' Electric Company, Canisteo, and the Canaseraga (N. Y.) Electric Company. If taken over, extensions will be made in the transmission lines.

RENSSELAER, N. Y.—The installation of an ornamental lighting system on Broadway is under consideration.

ROCHESTER, N. Y.—The City Council is considering extensions to the lighting system on several streets, to cost about $5,000. C. Arthur Poole is city engineer.

TROY, N. Y.—The City Council has approved an ordinance providing for the installation of electric lamps on Sage Avenue from Fifteenth Street to Burdette Avenue, and on Eaton Road from Sage Avenue to People's Avenue.

GLEN ROCK, PA.—The property of the Glen Rock Electric Light & Power Company has been acquired by the Edison Light & Power Company, York, which proposes to consolidate it with its own system.

OIL CITY, PA.—The installation of an ornamental lighting system on the south side of the business section, similar to the system on the north side, is under consideration by the City Council.

PHILADELPHIA, PA.—Plans are being prepared by A. W. Barnes, Perry Building, for five buildings and power house to be erected for the Children's Homeopathic Hospital at Franklin and Thompson Streets, to cost about $200,000.

PHILADELPHIA, PA.—Bids will be received by the Department of Wharves, Docks and Ferries, Municipal Pier No. 4, until Aug. 28, for electric wiring at the Porter Street Pier, No. 84 South Wharves. George F. Sproule is director.

PHILADELPHIA PA.—A permit has been granted to the Philadelphia Electric Company for the erection of a steam-driven electric generating plant on the Delaware River, near Erie Avenue. The plant will be built in three sections of approximately 200,000 kw. each, and will cost about $12,000,000. When completed the plant will be equipped with twelve turbo-generators, each of 50,000 kw. capacity. Contract has been awarded to Stone & Webster, Inc., Boston.

PITTSTON, PA.—The Scranton Electric Company is reported to be negotiating with the City Council relative to placing its electric wires underground in the principal streets of the city.

STROUDSBURG, PA.—The Pennsylvania Power & Light Company, Allentown, has been granted permission to extend its transmission lines from Stroudsburg along the Lackawanna Trail to Bartonsville and Tannersville.

HAVRE DE GRACE, MD.—A special election will be held on Aug. 30 to vote on the proposal to issue $300,000 in bonds, the proceeds to be used for the construction of a municipal electric plant.

MARTINSBURG, MD.—A committee has been appointed by the City Council to make investigations relative to the installation of a municipal electric light plant.

BARBOURSVILLE, W. VA.—The plant and the franchises of the Barboursville Water & Light Company is reported to have been acquired by the Consolidated Light & Power Company, Huntington.

NORFOLK, VA.—Contracts have been awarded for the construction of a large assembly plant at Norfolk for the Ford Motor Company, Detroit. The plans include a separate power house, equipped with a steam turbine made by the Ford company.

RICHMOND, VA.—The Chesapeake & Ohio Railroad Company, it is reported, plans to build a power house at its approved local locomotive and car shops. The cost of the project is estimated at $2,000,000.

WASHINGTON, D. C.—Bids will be received by the quartermaster, United States Marine Corps, until Sept. 2, for a quantity of electrical supplies, for use at the Quantico yard (Schedule 112).

North Central States

HART, MICH.—A resolution providing for an issue of $127,000 in bonds for the construction of a hydro-electric plant for Hart has been adopted by the Council. The proposition will be submitted to the voters at a special election to be called soon.

IRONWOOD, MICH. — An ornamental lighting system, covering 14 miles, between Ironwood and Wakefield, is reported to be under consideration by the Commissioners of Gogebic County. C. F. Winkler is county engineer.

CLEVELAND, OHIO.—Separate bids will be received at the office of the Commissioner of Purchases and Supplies until Aug. 29 as follows: For apparatus for fire alarm central office equipment; underground cable for fire signal system; apparatus for police telephone and telegraph signal system; underground cable for police signal system. Bidding blanks may be obtained at the Department of Public Safety, Room 330, City Hall.

FINDLAY, OHIO. — Steps have been taken by the Chamber of Commerce for the installation of an ornamental lighting system in Findlay.

FINDLAY, OHIO.—The Toledo, Bowling Green & Southern Traction Company is building an addition to its power plant, to cost about $15,000.

MINSTER, OHIO.—Bids will be received by the Village Council until Sept. 16 for rebuilding the overhead electrical distribution and street-lighting system, ornamental street-lighting system, motors and control for waterworks plant, and also for the supply of electrical energy. The Charles M. Kelso Company, Reibold Building, Dayton, is engineer.

YOUNGSTOWN, OHIO.—The Pennsylvania-Ohio Power & Light Company has applied for permission to issue $21,700,000 in bonds, part of the proceeds to be used for expansion and improvements.

OWENSBORO, KY. — The Owensboro, Rockport & Chicago Railroad Company contemplates the construction of an electric railway from Owensboro to Elmora, Ind.

WINCHESTER, KY. — The Winchester Waterworks Company, it is reported, plans to build a power house in connection with a new electrically operated pumping station in this section. W. Wheeler, 14 Beacon Street, Boston, is president and engineer.

MARION, IND.—The Board of Public Works is considering estimates of cost for a municipal electric light and power station.

NORWAY, IND. — The Public Service Commission has granted the Indiana Hydro-Electric Power Company permission to issue $1,750,000 in bonds and $437,600 in capital stock, the proceeds to be used for the second unit of the Tippecanoe River power development at Oakdale, 10 miles below the Norway project.

CARRIER MILLS, ILL. — The Illinois Commerce Commission has granted the Central Illinois Public Service Company permission to acquire the electric system of the Carrier Mills Utilities Company.

GREENVIEW, ILL.—The Central Illinois Public Service Company, Springfield, has acquired the property of the Greenview Electric Light & Power Company.

ROCKFORD, ILL.—The Rockford Electric Company has disposed of a bond issue of $924,000, part of the proceeds to be used for expansion and improvements.

BLOOMINGTON, WIS. — Negotiations have been completed between the Bloomington Electric Light & Power Company and the villages of Glen Haven and North Andover whereby the company will erect a transmission line from Bloomington to Glen Haven, via North Andover, a distance of 15 miles, to supply electricity to both villages and to residents along the proposed line for light and power.

EAU CLAIRE, WIS. — Petitions have been presented to the City Council for an extension to the ornamental lighting system, covering four blocks.

EAU CLAIRE, WIS. — Petitions have been presented to the City Council requesting the installation of ornamental lamps on Galloway, Bellinger and Madison Streets.

ELKHORN, WIS.—The City Council has approved the petition requesting the installation of an ornamental lighting system on Winso Street in the Ridgway section.

KAUKAUNA, WIS.—The installation of an ornamental lighting system to cover the entire business section of the city is under consideration.

LA CROSSE, WIS. — The Board of County Commissioners has approved the installation of ornamental lamps on Court House Square, for which $2,000 has been appropriated.

MADISON, WIS.—The installation of an ornamental lighting system on Upper West Washington Avenue is under consideration by the street-lighting committee.

NELSONVILLE, WIS.—The local hydro-electric plant and electric distributing system, owned by the Jackson Milling Company, has been purchased by the Amherst (Wis.) Electric Company, which contemplates improvements to the system and establishing a twenty-four service, and also to erect a transmission line, 6 miles long, to connect the Amherst and Nelsonville properties.

PESHTIGO, WIS.—Steps have been taken by the Commercial Club for extension of the ornamental lighting system in the downtown section of the city.

WINTHROP, MINN.—Plans for remodeling the municipal electric light plant are under consideration by the City Council. Toltz, King & Day, Inc., St. Paul, are engineers.

ACKLEY, IOWA.—Bids will be received by the City Council until Aug. 28, for one 125-kw. engine-generator set, 125/250 volts, direct connected, with switchboard, etc. The Charles L. Pillsbury Company, Minneapolis, is engineer.

CANTRIL, IOWA. — The citizens have voted to grant a franchise to the Iowa Electric Company, Cedar Rapids, to furnish electricity here.

FORT DODGE, IOWA.—Bids, it is reported, will be asked about Aug. 26, for the installation of an ornamental street-lighting system on a portion of First Avenue and a number of other streets in the business section. C. H. Reynolds is engineer.

KEOSAUQUA, IOWA.—The proposal to sell the municipal electric plant to the Iowa Electric Company, Cedar Rapids, has been approved by the voters.

IBERIA, MO. — The electric plants in Iberia and Dixon, it is reported, have been acquired by J. Sullivan, Hoboken. The new owner plans to supply electrical service in Iberia, Dixon and Crocker.

BOWBELLS, N. D.—The United Power Company has secured permission to construct a transmission line in Bowbells, connecting with its Noonan-Portal line, to operate at 13,200 volts.

CARRINGTON, N. D. — The Midwest Power Company has been granted permission to build a transmission line from Devil's Lake, to Carrington.

COGSWELL, N. D. — The Otter Tail Power Company has been granted permission by the State Railroad Commission to erect a 38,000-volt transmission line from Cogswell to Oakes.

ARMOUR, S. D. — The Northwestern Public Service Company has purchased the properties of the Consumer Utility Company, Huron, which operates in Armour, Corsica, Dimock, Ethan, Geddes, Lakes Andes, Parkston and other towns in this part of the state. This property will ultimately be connected by high-tension lines with other plants of the company at Yankton, Watertown, Huron and Aberdeen.

LESTERVILLE, S. D.—The citizens have voted in favor of securing electricity to operate the municipal electric system from the Eastern Dakota Electric Company, Yankton. The company plans to extend its transmission line from Utica to Lesterville immediately.

PIERRE, S. D.—Extensions and improvements to the municipal electric plant this year include the installation of a 400-hp. boiler and rebuilding the distribution lines. J. H. Starkey is city auditor.

Southern States

DURHAM, N. C.—The City Council is considering the installation of a new street-lighting system to cover all sections of the city.

HUNTERSVILLE, N. C.—The Huntersville Light & Power Company, recently organized, is reported to be planning the construction of a transmission line. M. C. Hunter, Huntersville, is interested in the company.

COLUMBUS, GA.—The Columbus Electric & Power Company contemplates improvements to the street-lighting system in the Rose Hill and North Highlands sections.

COLUMBUS, GA.—The Columbus Electric & Power Company contemplates the construction of a 60,000-kw. hydro-electric plant at Bartlett's Ferry. The initial installation will consist of two 15,000-kw. units. R. M. Harding is manager.

CHATTANOOGA, TENN.—Plans for the proposed third unit to be erected at the local cement-manufacturing plant of the Signal Mountain Portland Cement Company, to cost about $500,000, include a power house, which will supply power for the entire plant. All machinery will be electricaly operated.

LAUREL, MISS.—The City Commission has granted the Laurel Light & Power Company a new franchise, subject to the approval of the voters. Extensive improvements are contemplated by the company if the franchise is granted, including the installation of a new turbine, etc.

SANFORD, FLA.—The Sanford Farms Corporation, Medina, N. Y., is considering the construction of an electric light and power plant in connection with a new subdivision in Sanford during the next eighteen months.

BESSEMER, ALA.—The Alabama Power Company has acquired a site on the north Bessemer Road on which it will erect a substation for service in North Highland and Hueytown.

BIRMINGHAM, ALA. — The Alabama Power Company, it is reported, will soon begin on the erection of a high-tension transmission line between Hopwood, near Muscle Shoals, and the Twin Cities.

BIRMINGHAM, ALA.—Extensions contemplated by the Birmingham Electric Company during this year include the installation of two additional 1,000-kw. each railway rotary converters. J. S. Pevear is vice-president and general manager.

DEMOPOLIS, ALA.—Demopolis Electric Light & Power Company has petitioned the Public Service Commission for permission to sell its properties to the Alabama Power Company, Birmingham. The latter company, it is understood, contemplates erecting a transmission line from Uniontown to Demopolis.

THORSBY, ALA.—The Thorsby Light & Development Company is reported to have acquired the properties of the Ault Electric Light & Power Company.

BROOKHAVEN, MISS.—Bonds to the amount of $50,000 have been voted for improvements to the municipal electric and water plant. The total cost is estimated at $300,000 and will include new furnace, brick chimney, repairing steam pipe system, coal and ash-handling machinery, etc.

JACKSON, MISS.—The Mississippi Power Company is reported to be negotiating for the purchase of a number of utility properties in Mississippi. As properties are acquired they will be served with electricity from the system of the Alabama Power Company, and transmission lines will be erected connecting the various properties in Mississippi.

SHUQUALAK, MISS. — Bids, it is reported, will be received by Henry A. Mentz, consulting engineer, Magnolia, until Sept. 4, for the construction of water and light plant. Funds to the amount of $30,000 are available for this purpose.

COTTONPORT, LA.—Plans are being prepared by Henry A. Mentz, Magnolia, Miss., consulting engineer, for the installation of a municipal electric light plant, to cost about $50,000.

DALLAS, TEX.—Plans are under way for the installation of an ornamental lighting system in Akard, Ervay, Harwood, Live Oak, Elm, Lamar and Young Streets, to cost about $60,000. E. A. Kingsley is city engineer.

GALVESTON, TEX.—The City Commissioners are considering the purchase of 150 light transformers and 50 arc lamps.

Pacific and Mountain States

SEATTLE, WASH.—Arrangements are being made by the Puget Sound Power & Light Company to begin work on its Baker River project near Concrete. Plans for the initial installation provide for a development of 60,000 hp., to cost about $6,000,000. Later the output of the plant will be increased to 100,000 hp., with a total cost of $12,000,000.

SPOKANE, WASH.—Plans are under consideration to build a new pumping station, to be equipped with four electrically operated pumps of 50,000,000 gal. daily capacity, in connection with extensions to the waterworks system. A new machine shop will be erected between the proposed new pumping station and the main station, and a traveling crane

or gentry will be installed to handle the heavy machinery.

TENINO, WASH. — The Puget Sound Power & Light Company, Seattle, it is reported, will begin work at once on the erection of a high-tension transmission line from its plant at Electron to Tenino, a distance of about 38 miles. The cost of the line is estimated at $285,000, which includes an expenditure of $39,000 for a new substation to be built at Fern Hill, near Tacoma.

WICKERSHAM, WASH.—The Wickersham Light & Power Company has applied to the State Supervisor of Hydraulics for a permit to divert the water of Ennis Creek, a tributary of Samish River, to be utilized for light and power purposes.

PORTLAND, ORE. — Steps have been taken by the Chamber of Commerce for the installation of an ornamental lighting system on Broadway from the bridge to Madison Street.

ANAHEIM, CAL. — A proposition is under discussion by the Board of City Trustees for the construction of a joint municipal power plant with the city of Fullerton.

LONG BEACH, CAL.—The City Council is considering an ordinance for the installation of an ornamental street-lighting system on the Ocean Boulevard from Termino Avenue to Thirty-ninth Place.

LOS ANGELES, CAL.—The City Council is considering the installation of ornamental lamps on Sunset Boulevard from the junction with Hollywood Boulevard to Vista Street, and on Jefferson Street from Vermont Avenue to Tenth Avenue, a distance of 4 miles. The ordinance for lighting Sunset Boulevard from the Plaza to its junction with Hollywood Boulevard has been passed.

MADERA, CAL.—Preliminary plans are being prepared by the San Joaquin River Water Storage District for a storage dam and power house near Friant on the San Joaquin River. The plans provide for a development of about 30,000 hp., and a distributing system to irrigate 550,000 acres, at a cost of from $25,000,000 to $30,000,000. A. J. Wiley, Boise, Idaho, is consulting engineer, and H. Barnes, Los Banos, is resident engineer.

OAKLAND, CAL.—Plans for the Lake Merritt lighting system provide for underground conduit and connections, including 206 lamp standards, 37½ ft. high, mounted with single-bowl globe, to cost about $22,500. W. W. Harmon is city engineer.

OAKLAND, CAL.—The Pacific Gas & Electric Company has acquired a site in East Oakland for a new substation, which will replace the present station at the Ninety-sixth Avenue barn. The new station will cost about $250,000 and will have a capacity of 10,000 kw.

RED BLUFF, CAL.—Plans are under way for establishing an irrigation district of approximately 35,000 acres. The work will include 19 miles of canals, diversion dam and storage dam and pumping plants, to cost about $400,000. S. E. Kieffer, 57 Post Street, San Francisco, is consulting engineer.

SAN FRANCISCO, CAL. — The Pacific Telephone & Telegraph Company is planning for the installation of an underground conduit system on Ocean Avenue, to cost about $60,000. The company will also make extensions in its underground lines in a number of streets at Oakland, to cost about $150,000.

SANTA ANA, CAL.—The construction of a municipal electric light and power plant, to be used primarily for city street-lighting service, to cost about $75,000, is under consideration. John Sturgess, Los Angeles, electrical engineer, is interested in the project.

SANTA BARBARA, CAL.—The City Council is considering calling an election to vote on the proposal to issue bonds to establish a municipal electric plant. G. D. Morrison is city engineer.

ASHTON, IDAHO.—The Utah Power & Light Company, Salt Lake City, is reported to have acquired the power plant and franchise of the Warm Springs Power Company, located near Ashton.

Canada

ST. JOHNS, QUE.—Permission has been granted to the Southern Canada Power Company, Montreal, to erect a transmission line between the towns of St. Johns and Ste. Balise, a distance of 6½ miles.

ST. THERESE, QUE.—The Laval Electric Company has been given permission to erect a transmission line from the village of St. Eustache and the Hunt Club at Grand Frenieres.

Electrical Patents

Announced by U. S. Patent Office

Issued July 15, 1924

1,501,569. FREQUENCY MULTIPLIER SYSTEM; M. Osnos, Berlin, Germany. App. filed Aug. 8, 1922. Using a highly saturated iron reactance.

1,501,576. ELECTRICAL TESTING SYSTEM; D. F. Whiting, New York, N. Y. App. filed Sept. 22, 1921. For measuring the impedance of power and transmission line or circuits.

1,501,590. TEMPORARY SUPPORT FOR TELEPHONE WIRES; V. C. Flood, Huntington Park, Cal. App. filed June 2, 1921. While effecting a transposition thereof.

1,501,600. MEANS FOR OPERATING THE BRAKES ON VEHICLES; E. V. Hartford, Deal, N. J. App. filed April 22, 1921. Using a high-speed motor.

1,501,611. MULTIPLE LAMP SOCKET; S. G. Malby, Woodmont, and N. W. Spaulding, Ansonia, Conn. App. filed Oct. 29, 1921.

1,501,635. METHOD OF MAKING NOVOCAINE; W. A. Van Winkle, Midland, Mich. App. filed March 31, 1920.

1,501,636. ELECTRICAL GROUND CONNECTION CLAMP; C. Vitek, Maywood, Ill. App. filed Aug. 11, 1921.

1,501,638. RHEOSTAT; R. A. Weimer and M. A. Speicher, Colliers, W. Va. App. filed May 6, 1921. Grid type elements in parallel series.

1,501,648. TELEPHONE SYSTEM; R. D. Conway, Chatham, N. J. App. filed Aug. 7, 1920. Line switching device of the cross bar type.

1,501,649. TRANSFORMER; G. C. Cummings, East Orange, N. J. App. filed Dec. 26, 1919. For coupling apparatus for receiving alternating current signals of relatively low frequency with the line.

1,501,661. APPARATUS FOR AND SYSTEM OF MOTOR CONTROL; J. A. Hepperlen, East Orange, N. J. App. filed Feb. 19, 1923. To obtain wide speed variation.

1,501,663. MEASURING SYSTEM; C. H. Hoxie, Schenectady, N. Y. App. filed June 30, 1921. For minute alternating currents.

1,501,664. WIRELESS SIGNALING SYSTEM; A. Hund, Schenectady, N. Y. App. filed Sept. 18, 1914.

1,501,667. ELECTRICAL NETWORK; K. S. Johnson, Jersey City, N. J. App. filed May 11, 1921. Wave filters designed to permit the transmission of certain frequencies and suppress other frequencies.

1,501,668. TELEPHONE SYSTEM; L. Keller, New York, N. Y. App. filed July 20, 1920. Private branch exchange system employing machine switching.

1,501,669. INDUCTANCE DEVICE AND METHOD FOR OPERATING THE SAME; G. A. Kelsall, Belleville, N. J. App. filed Sept. 9, 1920. Unitary loading device for a duplex circuit.

1,501,670. WINDING MACHINE; H. Kock, Jamaica, N. Y. App. filed June 28, 1922. For winding electrical conductors upon pole pieces or cores to form electromagnets.

1,501,674. SELECTIVE CIRCUITS; M. B. Long, East Orange, N. J. App. filed June 17, 1922. For selectively receiving and transmitting alternating currents.

1,501,675. TELEPHONE EXCHANGE SYSTEM; A. E. Lundell and E. H. Clark, New York, N. Y. App. filed April 28, 1920. Semi-automatic type.

1,501,676. TELEPHONE EXCHANGE SYSTEM; A. E. Lundell, Chicago, Ill. App. filed July 1, 1920. Automatic.

1,501,679. PRINTING TELEGRAPH; D. Murray, London, England. App. filed Oct. 20, 1920. Operating mechanism driven by means of a continuously driven motor.

1,501,683-1,501,684. REMOTE CONTROL SYSTEM; A. A. Oswald, Bradley Beach, N. J. App. filed Dec. 6, 1920. Radio system for determining the course and operation of moving bodies, such as airplanes.

1,501,688. COLUMN STRAIN INSULATOR; L. Steinberger, Brooklyn, N. Y. App. filed May 23, 1919. Rod type.

1,501,691. SELECTIVE TRANSMISSION OF ELECTRIC WAVES; H. J. Vennes, Westmount, Que., Can. App. filed July 26, 1922. For the prevention of interference due to stray or leakage currents.

1,501,692. ELECTRODE; H. L. Ward, Chicago, Ill. App. filed July 1, 1922. Of the type used as cathodes and anodes in electrolytic apparatus.

1,501,693. TELEPHONE TRANSMISSION SYSTEM; R. S. Wilbur, Lyndhurst, N. J. App. filed Nov. 25, 1919. Four-wire repeater circuit therefor.

1,501,694. SIGNAL SYSTEM FOR TELEPHONES AND THE LIKE; F. H. N. Wohlers, Jamaica, N. Y. App. filed April 14, 1921.

1,501,698. INDICATING INSTRUMENT; A. R. Beckert, Lynn, Mass. App. filed Aug. 6, 1920. The movable elements of which are controlled by springs.

1,501,699. SYSTEM OF ELECTRIC DISTRIBUTION; E. F. Bliss, Alplaud, N. Y. App. filed Aug. 1, 1923. Arranged for connecting another source of current when the main source fails and for disconnecting the auxiliary source of current when the main source is again connected to the circuit.

1,501,711. DISTANT CONTROL SYSTEM; R. A. Heising, Millburn, N. J. App. filed Sept. 29, 1919. Radio system for determining the course and operation of moving bodies such as aeroplanes.

1,501,726. SIGNALING SYSTEM; C. W. Rice, Schenectady, N. Y. App. filed June 5, 1919. For receiving signals and producing an audible indication of the signals received.

1,501,729. OSCILLATION GENERATOR; E. O. Scriven, New York, N. Y. App. filed July 14, 1917. With means for preventing the transmission of oscillations of undesired frequencies.

1,501,732. COLUMN STRAIN INSULATOR; L. Steinberger, Brooklyn, N. Y. App. filed Dec. 10, 1918. Rod type.

1,501,733. RELAY; O. C. Traver, Schenectady, N. Y. App. filed Sept. 12, 1923. For controlling an electric circuit upon the occurrence of abnormal conditions with a discriminating action dependent upon the voltage and the current of the circuit.

1,501,735. WIRELESS SIGNALING SYSTEM; W. C. White, Schenectady, N. Y. App. filed June 5, 1915.

1,501,756. ELECTROLYTIC PROCESS AND CELL; J. C. Downs, Niagara Falls, N. Y. App. filed Aug. 18, 1922. Process of producing alkali metals and halogens by electrolysis of fused halide baths, as for example, sodium chloride.

1,501,768. ELECTRIC HEATER FOR FAUCETS; O. Graetzer, Zollikon, and O. F. Bruman, Zurich, Switzerland. App. filed Nov. 13, 1920.

1,501,782. APPARATUS FOR ELECTRICALLY BUTT WELDING TUBING; G. V. Johnston, Chicago, Ill. App. filed Oct. 4, 1920.

1,501,787. ELECTROMAGNET; H. Lacy, Surbiton, England. App. filed Nov. 3, 1921. With winding arranged to permit extension of operating voltage range.

1,501,830-1,501,831. WIRELESS SIGNALING SYSTEM; E. F. W. Alexanderson, Schenectady, N. Y. App. filed April 30, 1914. For transmitting signals.

1,501,832. MOTOR VEHICLE BATTERY BOX; J. E. Amend, Lovell, Wyoming. App. filed June 7, 1923. With usual circuit connections with the battery established in such manner that the battery may be removed from the vehicle without detaching any circuit wires.

1,501,848. IGNITION SYSTEM; J. H. Hunt, Dayton, O. App. filed March 26, 1919. For internal-combustion engines.

1,501,852. ENGINE STARTING SYSTEM; C. F. Kettering, Dayton, O. App. filed Nov. 2, 1918. For internal-combustion engines.

1,501,853. SYSTEM OF ELECTRICAL GENERATION; C. F. Kettering and W. A. Chryst, Dayton, O. App. filed Oct. 27, 1915. For lighting plants.

1,501,862. COOLING DEVICE FOR VALVES AND THE LIKE; T. Midgley, Jr., Dayton, O. App. filed Oct. 2, 1918. Using mercury in hollow stem of valve and providing radiating fins on valve stem.

1,501,871. TELEPHONE-EXCHANGE SYSTEM; F. A. Stearn, Paterson, N. J. App. filed June 3, 1921. Machine switching.

1,501,878. DYNAMO ELECTRIC MACHINE; J. Burke, Erie, Pa. App. filed June 15, 1922. For electric arc welding.